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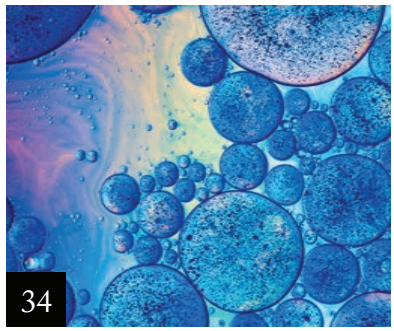

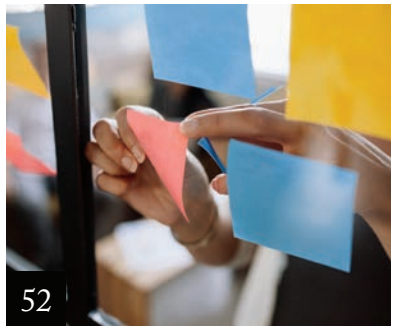

[FROM THE INTERIM EDITOR

Science Must Be Free

These are fraught times in academia. In the fall of 2022, an adjunct professor of art history at Hamline University in Minnesota showed a fourteenth-century image depicting the Prophet Muhammad in her class and lost her job. Understanding that her students might have varying reactions to these works, she warned her class—both on the syllabus and as the time approached—that the image of Muhammad would be shown and invited her students to come talk to her if they had concerns. Although no objections were raised before she displayed the image, afterward a student complained to the administration, and the professor was told her services would not be needed the following semester.

This episode comes out of the humanities, but the sciences should be different. The rejection of dogma has been a basic principle of the scientific project since at least the time of Galileo Galilei, so we might imagine that the sciences would be relatively free of ideological battles. Unfortunately, this is not the case.

In their cover story, "The Ideological Subversion of Biology," Jerry A. Coyne, University of Chicago emeritus professor and author of *Why Evolution Is True*, and Luana S. Maroja, a professor of biology at Williams College, describe how progressive ideology is impeding progress in the biological sciences and threatening the careers of individual researchers. To make matters worse, many of the attacks on free and valid investigation are coming not from outside political or government forces but from other researchers within the field. Coyne and Maroja's article is much longer than a typical feature story in Skeptical Inquirer, but we thought it important to have in our pages.

The dangers of "decolonizing science" in an effort to return to traditional forms of knowledge are highlighted in both the previous issue of Skeptical Inquirer on "Medical Pseudoscience around the World" and in Coyne and Maroja's cover story in the current issue. This is not an abstract threat; as this issue goes to press, reports emerged from India that the National Council of Educational Research and Training had dropped the teaching of Darwinian evolution in the school curriculum. Soon to be the most populous country in the world, India joins its neighbor Pakistan in removing natural selection—arguably the single most important idea in biological science—from the classroom. Of course, many Muslim countries already have an outright ban on the teaching of evolution in schools and colleges.

Elsewhere in this issue, physicist Martin Bier answers the burning question, "Does hot water freeze faster than cold?" Although the answer might seem obvious, Bier points out that this question has been debated for a very long time, including to the present day. Also, psychologist Edward Wasserman describes the surprising genesis of a now-ubiquitous office supply: the Post-it Note. As in every issue of this magazine, you will find a wide variety of voices and ideas all sharing one thing: an abiding concern for science and reason.

—Stuart Vyse

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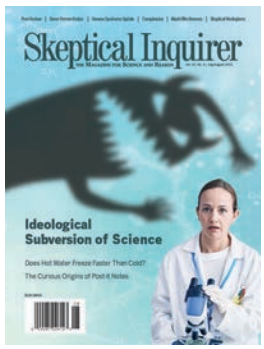

Intelligence Agencies: 'Havana Syndrome' Not Attack

Benjamin Radford

Reports coming out of Cuba in 2016 were bizarre, mysterious, and alarming: American diplomats in Havana were under attack by a terrifying and powerful—yet invisible—enemy. Victims complained of headaches, dizziness, nausea, and fatigue. While some suffered debilitating memory and concentration problems, others reported hearing loss and tinnitus. Some became disabled, while others took early retirement. The only clue about its origin was that a high-pitched sound was heard at the time. The (presumed) attacks were taken seriously by the State Department; complaints were lodged against China and Russia as Cuban diplomats were expelled.

Dubbed "Havana Syndrome," the cause and nature of the symptoms has been a mystery—and the subject of *Havana Syndrome: Mass Psychogenic Illness and the Real Story behind the Embassy Mystery and Hysteria*, by Robert Baloh and Robert Bartholomew (see the review in the May/June 2021 SI issue). The authors make the compelling case that much of the phenomena can be explained by mass psychogenic illness (MPI). A diagnosis of MPI doesn't mean that anyone is pretending or malingering; it merely means that the illness has an internal (psychological and physiological), not an external (environmental) source.

On March 1, the director of National Intelligence reported the conclusions from seven intelligence agencies researching the topic, determining it was "very unlikely" that any foreign government was responsible for the symptoms. The agencies examined about 1,000 cases of "anomalous health incidents" reported by embassy staff and others. While many believed that the symptoms were caused by some sort of sonic attack, no evidence was found supporting that conclusion. In fact, intercepted surveillance suggested that not only were enemy countries not behind the events but some thought it was being manufactured by the United States as a pretense for some other action.

As *The Washington Post* reported:

> The officials said that as analysts examined clusters of reported cases, including at U.S. embassies, they found no pattern or common set of conditions that could link individual cases. They also found no evidence, including forensic information or geolocation data, that would suggest an adversary had used a form of directed energy such as radio waves or ultrasonic beams. In some cases, there was no "direct line of sight" to affected personnel working at U.S. facilities, further casting doubt on the possibility that a hypothetical energy weapon could have been the culprit, one of the officials said.

Though some sort of directed, intentional attack was largely ruled out, no single specific cause was cited for the symptoms, which varied significantly in severity and nature from person to person. Almost all the cases could be attributed to preexisting medical conditions or environmental or other factors (such as clogged air ducts in offices). It's not unusual for victims of MPI to reject the diagnosis, and indeed the conclusions didn't sit well with some Havana Syndrome victims and their advocates, some of whom complained in part that the conclusion "does not track with our lived experiences." (For more, see Stuart Vyse's column "Mass Psychogenic Illness: The Unacceptable Diagnosis.")

Though not explicitly endorsing the MPI explanation, the report offers clear *de facto* support for it. CIA Director William Burns was careful to acknowledge the very real symptoms and suffering of the afflicted people but also that the intelligence community had conducted "one of the largest and most intensive investigations in the Agency's history. I and my leadership team stand firmly behind the work conducted and the findings." A press release added, "Needless to say, these findings do not call into question the very real experiences and symptoms that our colleagues and their family members have reported. Officers did exactly what we asked them to do: to take our guidance seriously and report suspicious experiences and symptoms." It remains possible that years or decades from now the intelligence community will discover new proof that some unknown sonic weapon was in fact deployed against the victims. But until then, this report (along with Havana Syndrome and Occam's razor) makes a compelling case that mass psychogenic illness is the most likely explanation. ■

The September/October 2023 issue of SI will include a full report on the rise and fall of Havana Syndrome by Robert Bartholomew and Robert Baloh.

Benjamin Radford is the deputy editor of the Skeptical Inquirer.

The Cochrane Masking Controversy (Spoiler: Masks Still Work)

Stuart Vyse

In January 2023, opponents of mask mandates found excellent support for their views when a large-scale study by the prestigious nonprofit Cochrane Library reported that "The pooled results of RCTs [randomized control trials] did not show a clear reduction in respiratory viral infection with the use of medical/surgical masks" (Jefferson et al. 2023, 3). Adding more fuel to the anti-mask fire, Professor Tom Jefferson of Oxford University, who was the lead author of the Cochrane review, told journalist Maryanne Demasi, "There is just no evidence that they make any difference. Full stop" (Demasi 2023).

Journalist John Tierney quickly responded with an article in the *City Journal*, a publication of the conservative Manhattan Institute for Policy Research, titled "Approximately Zero," and *New York Times* columnist Bret Stephens followed suit with "The Mask Mandates Did Nothing. Will Any Lessons Be Learned?"

For a minute it looked like faces all over the world might be liberated from their awkward coverings, but not so fast. A group of scientists from the universities of New South Wales, Toronto, and Oxford wrote a detailed yet quite readable response in *The Conversation*: "Yes, Masks Reduce the Risk of Spreading COVID, Despite a Review Saying They Don't" (MacIntyre et al. 2023) Later Stephens's *New York Times* colleague Zeynep Tufekci weighed in with a rebuttal column titled "Here's Why the Science Is Clear That Masks Work."

How are we to make sense of all this?

There is a basic problem: these studies are difficult to do. A true population-level randomized controlled trial (RCT)—the type of "gold standard" study included in the Cochrane review—would require randomly assigning people to "mask" and "no mask" groups with comparable levels of exposure and high levels of compliance. People in the mask group would have to wear masks all the time, and people in the no-mask group would have to refrain from wearing masks entirely. Masking places substantial demands on participants, and there are serious ethical issues involved in asking one group to mask and another to not mask during an ongoing pandemic. Conducting randomized controlled clinical trial (RCT) drug studies—as was done with the COVID-19 vaccines—is much easier. Participants are told they will be given a genuine drug or a placebo, but once the participants show up to get their shots, nothing else is required of them.

The conclusion of the recent Cochrane review was *not* that high-quality studies had shown that masks don't work; it was instead that the quality of the RCTs considered in the review was not adequate to establish the effectiveness of masks one way or the other. As Karla Soares-Weiser, the editor-in-chief of the Cochrane Library, said in a statement, "Many commentators have claimed that a recently updated Cochrane review shows that 'masks don't

work,' which is an inaccurate and misleading interpretation" (Tufekci 2023).

Soon after the Cochrane review was released, several scientists pointed out many of its weaknesses. For example, the review combined studies in which people wore masks part of the time with studies of continuous mask wearing. In the case of a hospital-based study, given the highly contagious nature of SARS-CoV-2 and the flu, workers who employed "targeted" use of masks (e.g., only when in direct contact with infected people) may have become infected elsewhere in the building while not masked (MacIntyre et al. 2023). This would weaken the observed effect of masking. In addition, most of the studies in the Cochrane review only examined the effects of masks in one direction, asking the question "Did uninfected mask-wearers become infected?" Another important use of masks is to prevent the transmission from infected mask-wearers to uninfected people; however, most of the studies in the review did not address this aspect. Meanwhile, previous reviews have shown that masks worn by people infected with the flu are effective in preventing the spread of the disease (MacIntyre et al. 2023).

Tufekci pointed out that some of the best evidence on masking comes from so-called "natural experiments" that played out as the pandemic unfolded. At Mass General Brigham in early 2020, before the introduction of universal masking, "the infection rate among health care workers doubled every 3.6 days and rose to 21.3 percent," but once universal masking was implemented, infection rates quicky fell to 11.4 percent. Of course, this is not a gold standard RCT experiment, but the study, which was published in the *Journal of the American Medical Association*, provides useful evidence of the value of masking (Wang et al. 2020).

Finally, what about that strong statement about the ineffectiveness of masks from lead Cochrane investigator Tom Jefferson? Given the source, it is not entirely surprising. In the same interview, Jefferson said there was no basis to say that COVID-19 was an airborne disease—despite all the large public health agencies saying otherwise (Tufekci 2023).

People will make their own choices when it comes to masks, but the weight of the evidence seems to support mask effectiveness and justify the public health advisories we have all experienced. Wear a mask or not, but don't throw away your KN95 because you think it doesn't work. It does. ■

References

Demasi, Maryanne. 2023. Exclusive: Lead author of new Cochrane review speaks out. *Maryanne Demasi, Reports* (February 5). Online at https://maryannedemasi.substack.com/p/exclusive-lead-author-of-new-cochrane.

Jefferson, T., L. Dooley, E. Ferroni, et al. 2023. Physical interventions to interrupt or reduce the spread of respiratory viruses. *Cochrane Database of Systematic Reviews* 1: CD006207.

MacIntyre, C.R., A.A. Chughtai, D. Fisman, et al. 2023. Yes, masks reduce the risk of spreading COVID, despite a review saying they don't. *The Conversation* (February 6). Online at https://theconversation.com/yes-masks-reduce-the-risk-of-spreading-covid-despite-a-review-saying-they-dont-198992.

Tufekci, Z. 2023. Here's why the science is clear that masks work. *The New York Times* (March 10). Online at https://www.nytimes.com/2023/03/10/opinion/masks-work-cochrane-study.html.

Wang, X., E.G. Ferro, G. Zhou, et al. 2020. Association between universal masking in a health care system and SARS-CoV-2 positivity among health care workers. *Journal of the American Medical Association* 324(7): 703–704. Online at https://jamanetwork.com/journals/jama/fullarticle/2768533.

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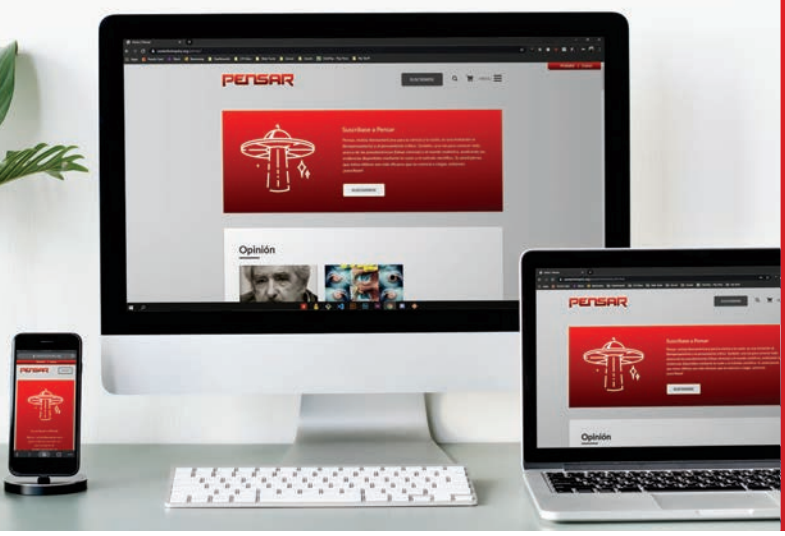

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Moon Matching Meets TikTok Trends

Benjamin Radford

A new viral trend on the social media juggernaut TikTok is promising to match lonely hearts with their soulmates by comparing halves of images of the moon's phase on the day they were born. You upload the two halves, and an animated video clip shows the two phases next to (or layered over) each other to see how well they fit together.

The lunar matching has a sort of intuitive aesthetic sense—the whole "you complete me" thing. After all, if two halves of a photo representing some (however irrelevant and tangential) aspects of two people match, then isn't it likely they'll be a match in person? Well, no.

The moon phase soulmate trend is old wine in new bottles. It's obviously a twist on astrological sun signs but has removed some of those trappings, possibly to give it a sense of scientific legitimacy. Even if you don't put any stock in astrology, you might still think this has some validity because it's tied to moon phases, which are of course real and scientifically proven. But the missing logical link remains: Why in the world would the phase of the moon have any connection to, or effect on, relationship compatibility? You can remove sun signs from the mix, but it doesn't make it any more valid or scientific.

Though astrology is this trend's clearest predecessor, it's only one of many. TikTok began in China, where there are many folk beliefs and myths about compatibility. For example, many people in Japan, South Korea, and elsewhere in Asia believe that a person's blood type (A, B, AB, or O) can help determine romantic and relationship compatibility. Obviously if any of these methods worked—that is, resulted in a statistically significant increase in successful matches—people wouldn't still be inventing new ones.

There's a more fundamental problem with the TikTok app: Unlike sun sign astrology that is based on the twelve zodiac signs (and hence categories of compatible matches), there are only eight moon phases (full moon, new moon, first quarter, etc.). As Rob Lea of Space.com noted:

> With an estimated eight billion people in the world, that means if one category is only compatible with one other category, each person should have around a billion possible "soulmates." If that's the case, then it's questionable why anyone would have to turn to an app to track down a soulmate in the first place.

This has all the hallmarks of a typical TikTok trend, including making a "game" out of something that is personal and relevant to users (such as a name, home city, face, or birthdate). Humans are social animals—teens especially so—and love to share information about themselves. People are always looking for ways to get an edge on life with little hacks or insights that can help them navigate an often scary and random world. That's the basis of many superstitions and why people seek out advice from psychics, astrologers, and others, particularly on topics such as relationships, health, money, and so on.

Even though there's no evidence that it works—and every reason to believe it couldn't—there's no chance it will be definitively debunked or disproven. For that you'd need a funded, large-scale study comparing moon phase to long-term compatibility. And even if some people return to TikTok in a few months to gloat about the perfect soulmate they matched with, keep in mind that it's not a representative sample; we're not hearing from the millions of others for whom it didn't work.

To be fair, it's not clear that everyone who's doing this necessarily believes the premise is true and that they're going to find a soulmate. Many surely do, but others just like to join a fun fad and share it with friends on social media. For many, it may be a silly fad, but there is a darker side if people are sincerely making life decisions based on a TikTok app. After all, because there's no validity to it, you could miss out on a great relationship if your moon phases don't match—or even get into a horrible one if they do. Journalists and scientists, especially astronomers, can use the trend to educate people about pseudoscience, critical thinking, and the genuinely amazing wonders of the universe. ■

Colombian Police: Magic and Exorcism Protect Criminals

Alejandro Borgo

Photo credit: policiacolombia | flickr

The headlines of two Colombian online newspapers on March 26, 2023, were startling: "Police Director Recognized the Practice of Exorcisms in the Fight against Crime" and "The Director of the Police Talked about Exorcisms, Abortion and the LGBTIQ Community."

The quotes were from Henry Sanabria, director of the Colombian National Police, who stated that drug traffickers and other dangerous criminals shield themselves from arrest through pacts with the devil. According to the news website noticiasscrn.com, "For General Sanabria religious symbols would serve to ward off evil. In fact, in the middle of the interview with *Semana* magazine, every time he referred to evil, he crossed himself, perhaps for his protection." Furthermore, "Sanabria assured that drug traffickers and the most dangerous criminals shield themselves with the devil through witchcraft as a protection mechanism. 'The existence of the devil is certain. I have seen it, I have perceived it,' he declared."

According to the news portal msn.com, Sanabria "Spoke about the use of exorcisms in the institution to kill criminals, about what happened in Caquetá where more than 70 police officers were kidnapped, the way in which he fights the devil, the LGBTIQ community and abortion, among other topics." Sanabria's faithful and hermetic belief in Catholicism has even led him to decorate his office with crucifixes and images that he uses for protection from evil. Sanabria also stated that he and other police officials have carried out exorcisms and other religious practices to combat crime against, for example, Pablo Escobar (in 1993); the leader of the FARC guerrilla, Alfonso Cano (in 2011); and Cano's military chief known as "Mono Jojoy" (in 2010). It is common for psychics to approach police to offer their "services" in solving crimes, sometimes of their own initiative, other times hired by victims' families (even though they are typically unsuccessful).

President Petro Weighs In

While avoiding the subject of exorcisms specifically, Colombian President Gustavo Petro said he was aware of Sanabria's beliefs but emphasized that they should not affect the function of the institution or the public. Sanabria's statements were criticized on social media; for example, feminist organizations and some congressmen called for Sanabria to be removed from office. However, many who read Sanabria's statements in the *Semana* interview left supportive comments online:

- "What a beautiful interview; I wish all public servants were like this man."
- "I am in a very large prayer group and we always pray [and] say the rosary for the police and for the soldiers of Colombia."
- "This general must have had an excellent spiritual upbringing, hence his impeccable and respectful personality. We need many personalities like him in Colombia to light the way forward, and there are plenty of mediocre people who believe they are important figures without being so."
- "When a man fears God, he is incorruptible. Thank you, General Sanabria, for being like that, respectful of God's law, of his principles and values that have always been instilled in him."

And the accolades continue. As of this writing, not a single comment criticizes General Sanabria for believing in the devil. Though Colombia is ostensibly a secular country, nearly 90 percent of the population is Christian, with 70 percent Roman Catholic. Belief in miracles and other aspects of Catholic theology are widespread—including among the Colombian National Police. ■

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Colombian Senator Promotes Medical Pseudoscience

Alejandro Borgo

In April 2023, Colombian news media reported that the country's "Health Reform Will Include Sobanderos and Yerbateros in a Preventive Focus." This policy echoes President López Obrador's support for traditional medicine in nearby Mexico.

Liberal Party Senator Alejandro Carlos Chacón made a right of petition on the necessary profiles for the future health system. The preventive and predictive approach to healthcare reform includes *yerbateros* (herbalists), *sobanderos* (healers), and *taitas* (a traditional name given to people who deserve respect).

In addition, Chacón says that they must meet some academic requirements: certificate, degree, diploma, and experience—although it is difficult to know what types of academic certificate such herbalists and healers may have.

Piedad Córdoba, senator of the Pacto Histórico, responded on Twitter:

Alejandro Carlos Chacón. Photo credit: camara.gov

"Conventional medicine is not in the universe, and what about indigenous knowledge? Midwifery? What you contemptuously call 'yerbateros' are people who heal with plants with a knowledge that is transmitted from generation to generation." She added, "Let's see right-wing liars, no one is saying that traditional medicine is going to replace conventional medicine, the health reform proposes to recognize the value of traditional medicine and support it so that in some regions of the country it complements conventional medicine."

The Colombia government faced crucial days for the approval of its most controversial project of healthcare reform, causing a stir in the cabinet and creating a challenge for Health Minister Carolina Corcho, responsible for convincing the parties to endorse the initiative in Congress. Based on these reports, pseudoscience may infect Colombian healthcare policies for years to come.

The *Noticias Caracol* video can be seen at https://www.youtube.com/watch?v=ZoqKF-DHp5o. ■

Study: Prevention Counters Conspiracy Belief

William M. London

Researchers in Ireland have concluded that the most promising approaches for reducing susceptibility of adults to conspiracy beliefs take place before exposure to those beliefs, and they focus on inoculating people with information or teaching them critical thinking. Writing in the open-access journal *PLOS One*, Cian O'Mahony and colleagues reported their assessment of twenty-five controlled-intervention studies identified through a systematic search of the relevant scholarly literature ("The Efficacy of Interventions in Reducing Belief in Conspiracy Theories: A Systematic Review"). They defined *conspiracy beliefs* as "a set of beliefs that explain important events as secret plots by powerful and malevolent groups." The authors noted that conspiracy beliefs are often linked to negative personal, social, and health-related consequences, such as reluctance to receive a COVID-19 vaccine. The authors concluded that there is no easy, practical solution to the problem of conspiracy beliefs; interventions appealing to emotions or empathy were not effective; counterarguments were not effective after research subjects had already been exposed to conspiracy theories; and "when interventions moved beyond putting participants in an analytical mindset, and actually explicitly taught them how to evaluate conspiracy beliefs using specific critical thinking skills, they were much less likely to have conspiracy beliefs."

In other words, it is important to get to susceptible people before the conspiracy theorists do. ■

A version of this news item previously appeared in the Consumer Health Digest *newsletter at Quackwatch.*

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When Conspiracies Finally Cost

Benjamin Radford

After years of documentation and litigation, sharing baseless conspiracy theories finally cost those who promote them in April 2023. Conspiracy theories, like mysteries in general, are common. From QAnon to Roswell alien bodies to moon-landing hoaxes, it's quite easy to create and perpetuate misinformation. Conspiracy theories persist partly because they benefit those who tell them in some way. They can be dangerous—even deadly—but those who share them typically are not harmed by them, and they cost relatively little in social capital. While most conspiracy claims are shielded by the First Amendment as protected free speech, some are potentially libelous—and that's where legal consequences come into the picture. Alex Jones discovered that in November 2022 when he was ordered to pay the families of Sandy Hook school shooting victims over $1 billion over his false conspiracy claims. (For more, see "Making Conspiracy Theories Cost: When Consequences Follow" in the May/June 2021 SI issue.)

On April 18, Fox News agreed to pay Dominion Voting System a record $787.5 million dollars to settle a lawsuit over the news network's demonstrably false claims that the 2020 election was stolen from former President Donald Trump via fraud. Details of the settlement were scant, and while Fox "acknowledged the Court's rulings finding certain claims about Dominion to be false," it offered neither elaboration nor apology. A similar lawsuit against Fox News by another election technology company, Smartmatic, is upcoming.

Barely a week later, another prominent election denier was forced to pay up. As first reported in *The Washington Post*, Mike Lindell—the Trump supporting conspiracy promoter and pillow salesman—was ordered by an arbitration panel to pay $5 million to a Nevada man, Robert Zeidman. It seems that Lindell "made a bold offer ahead of a 'cyber symposium' he held in August 2021 in South Dakota: He claimed he had data showing Chinese [election] interference and said he would pay $5 million to anyone who could prove the material was not from the previous year's U.S. election. He called the challenge 'Prove Mike Wrong.'" Zeidman—a computer forensics expert with forty-five years of experience and who twice voted for Trump—agreed to the challenge. After reviewing Lindell's data, he concluded that not only did it not substantiate Lindell's claims of voter fraud, but it wasn't even related to the 2020 election.

Editorial credit: Vic Hinterlang | Shutterstock.com

Lindell, unhappy that he'd been proved wrong, refused to pay Zeidman, spurring a lawsuit that ended up before the American Arbitration Association. The decision (case number 01-21-0017-1862, available online and worth reading) notes

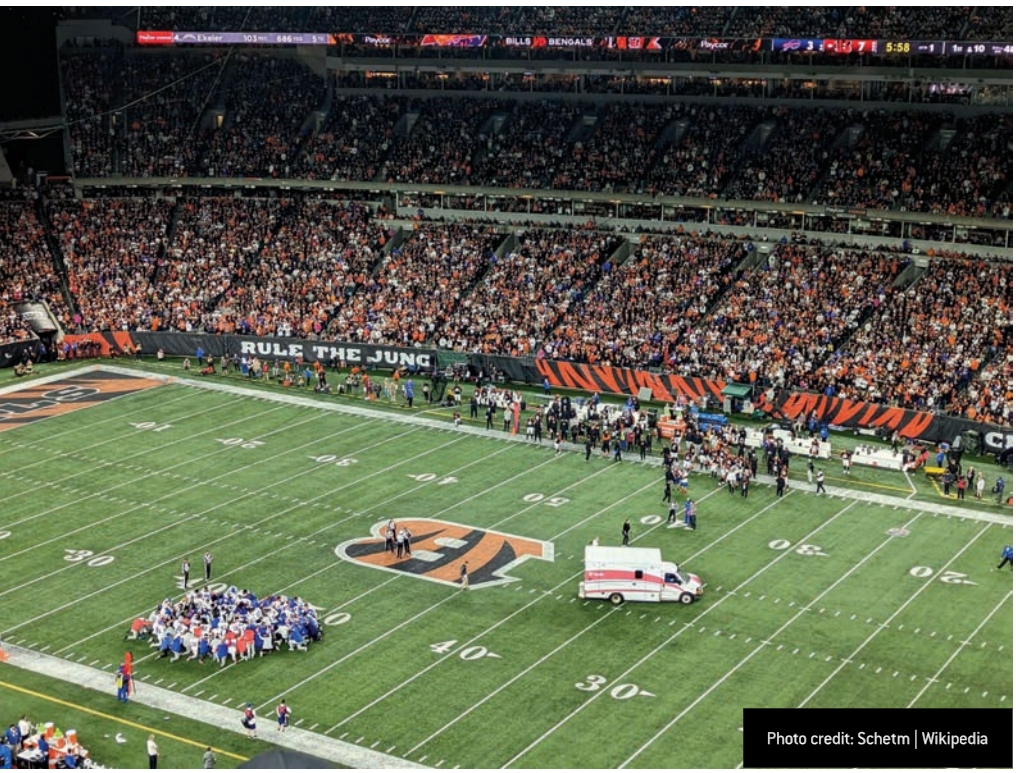
> Mr. Lindell readily conceded at the hearing he does not have the ability to analyze software data and says that he therefore relied on experts to analyze the data. He says the experts assured him that the data was real and proved China's interference with the election. … Mr. Zeidman told his friends that he was unlikely to win because Mr. Lindell would not offer a $5 million prize if Mr. Lindell had not had his own experts vet all the data to be presented.

Whatever toadying team provided Lindell his information, it was wrong. The panel determined that the offer was a legally binding contract and that "Mr. Zeidman performed under the contract. He proved the data Lindell LLC provided, and represented reflected information from the November 2020 election, unequivocally did not reflect November 2020 election data. Failure to pay Mr. Zeidman the $5 million prized was a breach of the contract, entitling him to recover."

Whether these plaintiffs will get all, or even most, of these judgments remains to be seen. But these cases—and more to come—suggest that when the cost of conspiracy mongering rises and results in real consequences, those who share them may think twice. ■

The Real Wonder of Damar Hamlin's Story

TIMOTHY J. REDMOND



Damar Hamlin, safety with the Buffalo Bills is taken off the field by an ambulance after collapsing on the field due to a cardiac arrest from a tackle to the chest during a game against the Cincinnati Bengals at Paycor Stadium on January 2, 2023.

On January 2, 2023, the Buffalo Bills and Cincinnati Bengals met on Monday Night Football. The game, which featured two of the season's best teams in the National Football League (NFL), was a highly anticipated affair. Yet few if any could have imagined the horror that would unfold on the field that night. At the 5:58 mark of the first quarter, Cincinnati's quarterback, Joe Burrow, tossed a pass to wide receiver Tee Higgins. Soon thereafter, Buffalo's twenty-four-year-old safety Damar Hamlin tackled Higgins to the ground, stood up, took two steps, and then collapsed. The defender went into cardiac arrest and was quickly administered CPR by the Bills medical staff. After his heartbeat was revived, Hamlin was removed from the arena in an ambulance and taken to the University of Cincinnati Medical Center (Mather 2023).

Although the game was suspended and eventually canceled outright, the Bills were scheduled to play against the New England Patriots just six days later on January 8, 2023. The team was understandably traumatized and in no condition to take the field. Whispers of postponing the game began to whirl (Hartwell 2023). Yet the Bills' spirits (and the game's prospects) received a boost when it was reported that Hamlin had not only awoken from his coma but was also neurologically intact and communicative. In fact, one of the first questions he asked the doctors was, "Did we win?" "Yes, Damar," his doctor dramatically replied, "you won the game of life" (Camenker 2023).

In light of this positive news, the Bills and the Patriots proceeded to play as planned before an emotional and ecstatic crowd at Highmark Stadium in Orchard Park, New York. Hamlin's jersey number—three—was ubiquitous. Fans honored the safety by holding three fingers aloft in the air; the Bills organization outlined the number three on the fields' thirty-yard lines; and several Buffalo players entered the field of play carrying flags emblazoned with their teammate's number (Wawrow 2023). Then on the opening kickoff—the first play since Hamlin's injury—Bills running back Nyheim Hines returned the ball ninety-six yards for a touchdown. It was a breathtaking start to an incredible game that saw the Bills go on to defeat the Patriots by a score of 35–23 (McCarriston 2023). Following the game, some commentators argued that "it was not a coincidence" that Buffalo's star quarterback Josh Allen had thrown for three touchdowns or that the Bills' defense had knabbed three interceptions during the match (Uplifting STAR 2023). Allen himself held back tears as he told reporters that he had been informed by the team's director of communication that it had been "three years and three months since the [Bills'] last kickoff return (McCarriston 2023).

However, a more critical examination of these remarkable events tells a different story. Human beings are pattern-seeking animals. According to author and skeptic Michael Shermer, people "look for and find patterns in our world and in our lives, then weave narratives around those patterns to bring them to life and give them meaning" (Shermer 2000). Sometimes these patterns are deliberate. But sometimes they're not—that is, sometimes the patterns we find *are* just coincidences.

People may mistakenly interpret a

coincidence as a meaningful pattern due to the correlation and lottery fallacies. The correlation fallacy occurs when one assumes a cause and effect relationship between two variables simply because they occur together (Novella et al. 2018). For instance, Josh Allen and the Bills' director of communication (among others) believed that since Damar Hamlin's jersey number was three and the number three repeatedly appeared on the game's scoresheet, something about the former must have caused the latter. But a correlation does not necessarily imply causation. The correlation might simply be due to chance.

The lottery fallacy, in turn, presumes that the more improbable a correlation, the more probable a cause. The likelihood that the aforementioned events would come to pass by chance alone was surely low. But come to pass they did. Accordingly, many believed that the widespread appearance of the number three on the game's scoresheet must have had a cause and that a supernatural or cosmic explanation was as good as any. But the lottery fallacy confuses the probability of *one* outcome with the probability of *some* outcome (Novella et al. 2018). If one million people each purchase a single raffle ticket, the odds that *any one* of them will win are one in one million. But the odds that *someone* will win are certain (Redmond 2019). Similarly, while the odds that a *particular* statistic from a given game would match an injured teammate's number may be low, the odds that *some* statistic from the game would include the relevant jersey number are rather high.

Now, it needs to be said that the fact that Josh Allen threw for three touchdowns and that the Bills' defense nabbed three interceptions during the game wasn't as improbable as one might think. Allen is a phenomenal quarterback. In fact, he tossed three touchdowns on three additional occasions during the 2022 season alone and on eight other occasions during his five-year career (including the playoffs) (Fantasy Pros 2023a). The Buffalo Bills' defense also had three interceptions during their first game of the season versus the Los Angeles Rams (Fantasy Pros 2023b). In other words, Allen threw three touchdowns in 22 percent of his games in the 2022 season (four games out of a total of eighteen games), and the Bills' defense grabbed three interceptions in 11 percent of their games during the 2022 season (two games out of a total of eighteen games). So, the chance that these accomplishments would come to pass during the Bills-Patriots game were hardly insignificant.

And what about the comment that it was three years and three months since the Bills' last kickoff return for a touchdown? It was actually three years, two and one-half months, but that's surely an extraordinary occurrence. Yet football games generate an inordinate number of numerical stats, ranging from player rushing and passing yards to touchdowns and interceptions to sacks and the final score. Imagine that the Bills didn't return the opening kickoff for a touchdown but scored on their third offensive play instead. Or that that they scored a touchdown at the 13:33 mark of the first quarter. Or that Allen had thrown for 333 yards. Or imagine that the Bills' defense held the Patriots to just three points or had an interception that they returned for a thirty-three-yard touchdown. Surely people would have imbued *those* figures with significance, as evidence of some transcendental acknowledgement of Hamlin's injury and recovery. Of course, it is the endless number of improbable coincidences that renders such a coincidence so probable.

Be that as it may, something truly remarkable did occur on the evening of January 2 and in the weeks thereafter. The Buffalo Bills medical staff and the doctors and nurses at the University of Cincinnati Medical Center saved a young man's life. What's more, people who were moved by the drama that unfolded over the course of Hamlin's recovery donated more than $8 million to his foundation to provide toys for needy children (Staff 2023). Those facts alone—those real patterns—should be enough to fill us with hope and wonder. ■

References

Camenker, Jacob. 2023. What happened to Damar Hamlin? Timeline of Bills' safety cardiac arrest and his remarkable recovery. *The Sporting News* (January 15).

Fantasy Pros. 2023a. Josh Allen game log. Online at https://www.fantasypros.com/nfl/games/josh-allen-qb.php?season=2018

———. 2023b. Buffalo Bills game log. Online at https://www.fantasypros.com/nfl/games/buffalo-defense.php

Hartwell, Darren. 2023. NFL not ruling out postponement of week 18 Bills-Patriots game. NBC Sports (January 4).

Mather, Victor. 2023. What to know about Damar Hamlin's injury. *The New York Times* (January 12).

McCarriston, Shanna. 2023. Bills players voice support for Damar Hamlin after emotional win over Patriots: We did it for 3. CBSSports.com (January 8).

Novella, Steven, Bob Novella, Cara Santa Maria, et al. 2018. *The Skeptics Guide to the Universe: How to Know What's Really Real in a World Increasingly Full of Fake*. New York, NY: Grand Central Publishing.

Redmond, Timothy J. 2019. The presidential curse and the election of 2020. Skeptical Inquirer 43(6) (November/December).

Shermer, Michael. 2000. We are the world. *The Los Angeles Times* (February 6).

Staff. 2023. Damar Hamlin's foundations surpasses $8M in donations. WGRZ (January 7).

Uplifting STAR. 2023. It wasn't a coincidence how many times the number '3' appeared in the Bills' game on Sunday! [Video]. YouTube. Online at https://www.youtube.com/watch?v=7CNtsvKXFxY&lc=Ugz6F8KwncqlOHdI-9t4AaABAg.

Wawrow, John. 2023. Hamlin in their hearts, the NFL pays tribute to no. 3. The Associated Press (January 8).

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[POSTCARDS FROM REALITY

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The Existential Threat That Dare Not Speak Its Name

We've been hearing a lot these days about ChatGPT and the existential threat it portends.

ChatGPT is an artificial intelligence language model that allows users to have seemingly natural conversations with a computer. It can perform tasks such as essay writing and question answering with remarkable speed and alacrity and with enough human-seeming style to fool teachers and employers. The invention has raised the specter of a just-around-the-corner artificial intelligence dystopia where machines are coming for your job—if not your life.

Serious people are worried about this. Perhaps reasonably so. But I do take solace in the views of one of the smartest people on the subject, Jeff Hawkins, who wrote the groundbreaking neuroscience book *A Thousand Brains*. He thinks AI doomsayers get it wrong because machines learn best within static systems and not when conditions change constantly, as they do in real life. We are unlikely to lose control, Hawkins assures, because machines won't have human drives and motivations, such as to self-replicate or dominate. Meanwhile, machine intelligence can provide great benefits to humanity if deployed well.

But this column is about another existential threat where the risks are not theoretical: overpopulation. The world's population surpassed eight billion people in November 2022. It was three billion in 1960, a year before I was born and the decade in which *The Population Bomb* was published. People have poo-pooed author Paul Ehrlich's book as catastrophism that never came true. (Anne Ehrlich, Paul's wife, was coauthor but was not credited due to pressure from the publisher.) But just because our science and technology has made it possible so far to concomitantly increase population and feed most of us doesn't mean there won't be a reckoning. Eventually we will have to stem population growth—or have nature do it for us.

Projections by the United Nations are that by the end of the century we will exceed ten billion people on this small blue dot. It is completely unsustainable.

Human population is *the* essential driver of climate change because human needs generate energy use and consumption. Overpopulation is the reason we are stripping the planet of resources and habitats. And it is largely why we are despoiling the only home we will probably ever have.

But it is barely discussed. Overpopulation is the existential threat that dare not speak its name, as taboo as it is consequential.

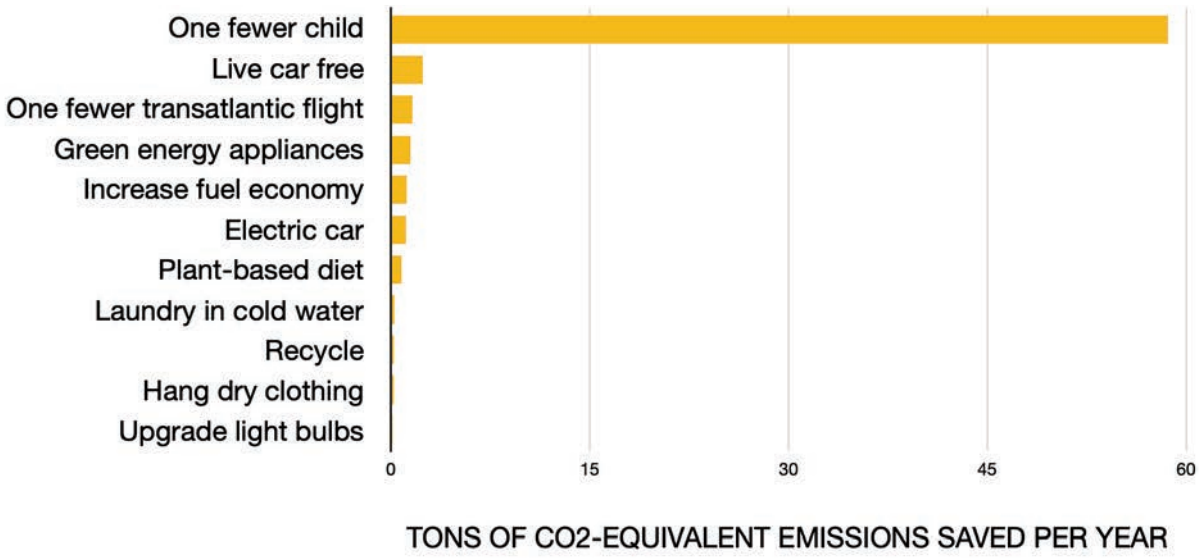
On the climate, there is no action a person can take that is more beneficial for reducing greenhouse gas emissions than choosing to have no children (or at least fewer).

The graphic on p. 15 drives that point home better than any words.

A piece in *The Conversation* last year by Max Callaghan based on climate research at the University of Leeds had the headline: "Here Are the Most Effective Things You Can Do to Fight Climate Change." Of the dozens of suggested actions you could take, it mentioned going car-free, taking fewer flights, switching to a vegan diet, having no pets, and living in a smaller space or cohabitating (Callaghan 2022). Nowhere was there any mention of family size or having fewer children.

The United Nations climate action website (https://www.un.org/en/climatechange/science/causes-effects-climate-change) talks about the science of climate change and lists the top contributors, including "generating power," "manufacturing goods," "using transportation," and other causes. Under "consuming too much," it points a finger at the wealthy who contribute a far larger percent of greenhouse gas emissions per capita than do the poor, which is definitely a problem. But there again nowhere does it say that overpopulation is a cause (or that the poor have disproportionately large families).

It's not only the raw numbers of people inhabiting the planet but *where* those people will be born that will add to human misery. Most of the world's population growth is expected to take place in Africa, where the negative impacts of climate change are likely to be



Estimated tons of CO_2-equivalent emission saved per year for various environmental actions. Based on data from Wynes and Nicholas 2017.

extreme.

According to Wikipedia, population is projected to increase by 1.9 billion people between 2020 and 2050. Out of this figure, Africa will add 1.2 billion people, Asia will add 0.7 billion people, and there will be no net increases projected anywhere else. These numbers for Africa are anticipated even if the rate of fertility falls because the African population currently has such a large proportion of young people. Nigeria, Africa's most populous nation, is expected to have more people than the United States by about 2050.

Currently, a child born in an African nation generates significantly less greenhouse gas emissions than one born in the United States. But developing nations are striving to better their living standards looking to replicate those in the United States and elsewhere in the developed world. It is cold comfort that additional children in African nations are not as climate adverse as those born in richer countries. It's simply a reflection of poverty, not conscious conservation and environmental stewardship.

British cosmologist and astrophysicist Martin Rees recently warned about the impact of population growth and the way it will concentrate in Africa. In his talk before the Royal Society for the Encouragement of Arts, Manufactures and Commerce, based in turn on his book *If Science Is to Save Us*, Rees says the issue of population is underdiscussed as a dire threat facing humanity (RSA 2022). He predicts mass migration and social unrest if definitive steps are not taken and recommends a kind of Marshall Plan for African nations to bring those economies up by leapfrogging right to sustainable energy and technologies.

How about also providing free birth control, abortions, tubal ligations, vasectomies, and reproductive health education to anyone interested? I can already hear the unhinged accusations of colonial racism for daring to want solutions for people with an acute (and about-to-get-way-worse) overpopulation problem.

Talking about population control conjures up China's authoritarian One Child policy and Indira Gandhi's forced sterilization program in India. Any talk of responsibly reining in human overpopulation is denounced as racist and colonialist like so much else these days. Understandably, good people would rather leave the topic aside than be called these bad things. Lately we've even seen hyperventilation about cratering fertility rates in Japan and in most advanced economies. Even China is looking to bolster birthrates.

This is unbelievably short-sighted and irresponsible. We should be encouraging low birth rates everywhere. We should be aligning incentives to get people to have fewer children—perhaps by giving people tax breaks who don't have children as opposed to those who do. We should be making certain that easily obtainable and affordable birth control and abortion is available to girls and women around the globe. (Let's not talk about the reverse course the United States is taking on this thanks to religion. It's too depressing.) Educating women and providing them with economic opportunities is also a known driver of smaller family sizes.

Everyone who cares about climate action should know the impacts that having a child will have on greenhouse gas emissions so they can factor that into their family planning.

Overpopulation is not simply a contributing factor to climate change; it is *the* contributing factor. It should get talked about with the depth, frequency, and urgency it deserves. ■

References

Callaghan, Max. 2022. Here are the most effective things you can do to fight climate change. *The Conversation* (July 1). Online at https://theconversation.com/here-are-the-most-effective-things-you-can-do-to-fight-climate-change-183555.

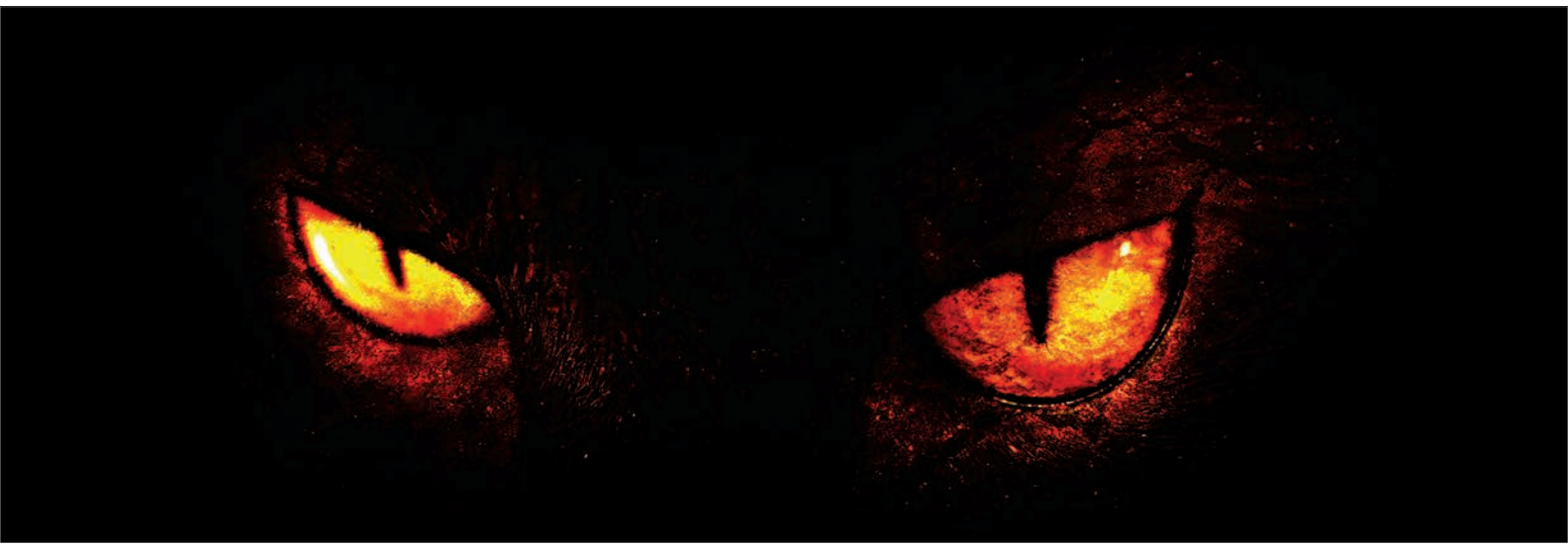
RSA. 2022. If science is to save us | Martin Rees | RSA REPLAY (video). Online at https://www.youtube.com/watch?v=NvlxS8rn37s.

Wynes, Seth, and Kimberly A. Nicholas. 2017. The climate mitigation gap: Education and government recommendations miss the most effective individual actions. *Environmental Research Letters* 12(7). Online at https://iopscience.iop.org/article/10.1088/1748-9326/aa7541.

[INVESTIGATIVE FILES JOE NICKELL

Joe Nickell, PhD, has been called the world's foremost monster hunter, having uncovered the real-life creatures behind such cryptids as the Flatwoods Monster, Mothman, Sasquatch, the Gloucester Sea Serpent, and many, many others.

Identifying the Enigmatic 'Dover Demon'



According to *The Field Guide to North American Monsters* (Blackman 1998, 106), "Few cases in the history of cryptozoology have received as much attention as the peculiar Dover Demon affair" of 1977. All these years later, that remains even more true. But was the subject itself true? Was it really some hitherto unknown and seemingly impossible creature? Or a real animal seen by four badly mistaken witnesses? Or even, as local police first thought, "nothing more than a school vacation hoax" (Associated Press 1977)? One more question: Shall we really dare to take on such a case–especially after so much time has elapsed?[1]

Three Encounters, Four Witnesses

The strange affair began about 10:30 p.m. on the night of April 21, 1977, when Bill Bartlett (age seventeen) caught a strange-looking creature in his Volkswagen's headlights while driving with two friends along a dark road in Dover, Massachusetts. (The town, then with a population of about 5,000, consisted of mostly woods and pastures, some fifteen miles southwest of Boston.) Bartlett claimed he had seen the creature beside a low rock wall on his left and that he first thought it was a cat or dog until he saw it had an extremely large head. It turned to look at him with shining orange eyes as he drove by.

Bartlett asked his friends if they had seen the being. He appeared visibly shaken. They told him they had not been looking in that direction and urged him to turn around and drive back. However, they saw no sign of the monster. Bartlett described it as some three-and-a-half-feet tall, having a watermelon-shaped head with big eyes (albeit lacking any other features), and a very thin body with "spindly" arms and legs. He claimed it was a peach color but was "almost whitish" near its very long fingers (Webb 1977, 42–47). Subsequently, he made at least two drawings of what he reported having seen (Webb 1977, 43–44).

A second encounter about two hours later was reported by John Baxter, age fifteen, who was walking home from his girlfriend's house. About 1.2 miles northeast of the Bartlett location, Baxter saw the silhouette of a "very small" figure walking toward him. He thought it might be a kid he knew and called out, but the figure did not respond. When it was about fifteen feet away (approximately twenty-five feet by later investigators' measurement), it stopped, and Baxter too halted. Suddenly the entity scurried away down an embankment, across a shallow wooded gully, and up the opposite side. Baxter started in pursuit, but after a few steps he stopped and, feeling uneasy, backed away (Webb 1977, 46–48).[2]

Baxter said he could hear the small creature running in the dry leaves; it came into view again across the gully (about thirty feet away by the investigators' later tape measurement). Baxter said he thought the dark silhouette resembled a monkey's, except that it had a large "figure-eight" head (as distinguished from the shape of a watermelon, which does not have double lobes). He

told investigators its feet were "molded" around a rock near a tree, and its lengthy fingers appeared to grip the trunk—as for support. He could not say how many digits were on its hands or feet. Baxter thought the creature appeared as if it might be ready to spring at him. So he "walked very fast" back to the street and on to an intersection, where he caught a ride home. He thought his encounter lasted less than ten minutes—"probably considerably less"—concluded the report (Webb 1977, 47–49).

The third encounter took place the following evening (April 22), nearly twenty-four hours after John Baxter's sighting. There were two witnesses, Will Taintor (age eighteen) and his girlfriend, Abby Brabham (age fifteen). Taintor and Brabham glimpsed the "tan" creature, resembling a monkey, crouched in the road. Apparently neither of the two noticed hands or feet, but they described the entity as having a large "oblong" head (again, not double-lobed) and eyes that shone "bright green" (she insisted) in the headlights. Taintor then sped up at Brabham's urging. Investigators' subsequent timed re-enactment placed the duration of the pair's observation at approximately five seconds (Webb 1977, 49–50).

Account Assessment

Attempts to identify a real animal behind the sightings have not fared well. For example, one theory was that it was a baby moose (Kottmeyer 1998). However, its large size, four-legged stance, and big ears render that idea most unlikely.

Nevertheless, three encounters by four individuals have been taken as corroboration of what has been described, investigators having been at pains to characterize the eyewitnesses as truthful. Still, there are some problems.

First, Bill Bartlett would later admit he had smoked marijuana approximately an hour before his sighting, although he believed he was clear-headed "during the crucial moments of the encounter" (Webb 1977, 45). Also, the fact that John Baxter wrote sci-fi stories was, according to the investigators, "a troublesome feature that can't be completely ignored" (Webb 1977, 52).

Then there is the issue of collaboration. The witnesses are frequently treated as if they had completely independent observations; however, that seems not to be the case. When Baxter (the second to see the creature) made a drawing of what he saw, it was purportedly before he had learned of Bartlett's sighting and drawing, according to Webb (1977, 48), who actually uses the word *allegedly*. There indeed seems reason to doubt Baxter's complete lack of foreknowledge—especially given the striking similarity of very minor details. Such agreement includes the feet being "molded" to rocks and the apparently changed shape of the head: from Bartlett's original "watermelon" and "oblong" to both showing a figure-eight drawing (i.e., peanut-shaped). In other words, I think Bartlett may have been influenced soon by Baxter rather than entirely the other way around (Webb 1977, 46, 48).

Certainly Abby Brabham's boyfriend, Will Taintor, had learned about Bartlett's original sighting—before Taintor and Brabham had their encounter. Taintor told investigators he asked Brabham leading questions, supposedly as a means of testing her. Then, later, he divulged to her what he knew. (Her insistence that the eyeshine was green rather than orange is supposed to bolster her independence. However, it is difficult not to notice how both Brabham and Bartlett apparently made reference to a monkey-like body; Webb 1977, 48–49.) Again, Brabham said the creature's head was "oblong," consistent with Bartlett's original "watermelon-shaped," but emphatically at variance with later sketches by Bartlett and Baxter showing enormous double-lobed heads.

Getting Real

These problems remaining, I believe we can nevertheless still quite credibly place an identified suspect at Dover, Massachusetts, in April 1977—a bipedal creature with a large, round, earless head; missing nose and mouth; and having shining eyes; one standing on spindly legs with … well, read on.

The creature I have in mind is most active between early evening and early morning. Belonging to the order *strigiformes*, it is among the easiest of its family to identify, yet it is one of the world's least understood. Although it was given its own genus, *Nyctea*, in 1809, in 2003 it was reclassified into the *Bubo* genus (Bannick 2020, 7–52).

We are identifying *Bubo scandiacus*. It is interesting that its closest living relative is *Bubo virginianus*, because that creature actually piqued the interest of the cryptozoologist who gave the Dover Demon its popular name! He is Loren Coleman (whom I know personally). Of him, Walter Webb (1977, 55) states:

> Loren was the first to note some resemblance between the Dover entity and the famous Kelly, Kentucky, "little men" incident of 1955. Yet major differences abound, not the least of which were the Kentucky creatures' large floppy ears. Like the Dover Demon, the Kelly being has never been reported before or since.

Now that is no longer true. I identified the Kelly beings as a pair of the genus *Bubo virginianus* (Nickell 2011, 167–173).

In other words, the Kelly beings were great horned owls and the Dover Demon, we can now spell out, was the snowy owl—indeed itself a subject of myth and mystery, including its anthropomorphized version as Harry Potter's pet, Hedwig. Snowy owl experts, including wildlife photographer Paul Bannick (2020), have done much to teach us the secret truths about this fascinating creature.

Snowy owls breed on the Arctic tundra but exhibit a broad range of movements—some flying hundreds of miles for a variety of complex reasons. They tend to winter as far south as the northern United States but will rarely be seen in a tree. They prefer open country; one may sit on a rooftop, post, or other resting place such as rocky ground. It also prefers to be near water (Bannick 2020, 58; Alsop 2001, 372; Bull and Farrand 1994, 548; "Snowy owl" 2023).

Identification

Let us now take a new look at the Dover Demon, recognizing its true

identity behind the longstanding camouflage of misperception. It is a large, round-headed owl, indeed one of the world's biggest. It is the only white owl in North America—keeping in mind that the females and juveniles have a relatively large amount of dusky barred (or dash-like) markings, in contrast to the older males, which are effectively all-white (Bull and Farrand 1994; Bannick 2020, 27). The two genders are about the same total body length of approximately twenty-four inches, but the female is roughly 25 percent heavier than the male (Bannick 2020, 27). For all these reasons, we can be confident that the Dover Demon was a male with its more svelte look.

Clearly the purported height of the Dover Demon is excessive for it to have been a snowy owl, which would have been unlikely to be more than about twenty-seven inches tall (Alsop 2001, 372). However, the height of unknown creatures is often exaggerated upward as we see in the Kelly, Kentucky, case. There, for instance, the height of the creatures was first estimated at four feet, but a main witness later downsized that to "two and a half feet tall" (Nickell 2011, 171)—more compatible to the height of a great horned owl at about twenty-five inches (Alsop 2001, 371). Had the Dover Demon's estimated height of three-and-a-half to four feet (given by Bartlett [Webb 1977, 46]) been reconsidered by investigators, I suspect it too would have been downsized. (Still, a snowy owl that had surprisingly appeared in southern California toward the end of 2022 was, according to one eyewitness, "absolutely ginormous," although of course no actual measurement was available [Levenson 2023].)

The snowy owl is often called "earless" (like the Dover Demon) because, instead of external ears, it has only openings on either side of its head hidden by tiny "ear tufts." (These may become noticeable when the owl flies into a strong wind [Bannick 1977, 27, 32, 39].) Similarly, the Dover Demon's lack of a nose or mouth—making the head appear featureless except for the eyes (Webb 1977, 32)—was due to the owl's small beak being nearly hidden by surrounding long, white, dense bristles (Bannick 1977, 32; "Snowy owl" 2023). This apparent absence of ears, nose, and mouth represents a powerful set of similarities between the Dover Demon and the real creature behind it, the snowy owl.

A laughable error in the Bartlett and Baxter drawings—so *mutually* wrong and thus probably again indicative of cross-pollination—is the absurdly thin neck that would have been "anatomically impossible" (Radford 2023, 32). Now owls are generally spoken of as having no neck, as if the head were placed directly atop the body (see Bull and Ferrand 1994, 297–310). However, Bartlett and Baxter each drew the Dover Demon with an enormous double-lobed head supported by a thin neck. The similar error in each drawing bespeaks of one person misleading the other on the issue. Indeed, a possibility for the double-lobed-head look is simply the natural narrowing between the head and upper body—the actual neck area (see Alsop 2001, 372). Remember, the Dover Demon witnesses did not really know what they were looking at. Thus the result of this narrowing is to create—by combining head and shoulders—the "figure eight" feature.

Another illusion-caused error involves the "arms" with "hands." As shown by the Kelly, Kentucky, creatures (the great horned owls), when these owls are not seen in flight—and not understood to be owls—their partially opened wings may be mistaken for "long spindly arms" (Webb 1977, 46), because what is seen then are the wings' bright front edges. (See Bannick 2020, 31, 64, 92, 99.) At the ends of the Dover Demon's "arms" were what both Bartlett and Baxter spoke of as "large hands" or again "long fingers" (Webb 1977, 46, 48). These were the five (or so) splayed feathers at the snowy owl's wingtips. (See examples in Bannick 2020, 34, 92–99. See also Nickell 2011, 167–173.) In fact, the portion of a bird's wing that corresponds to the human hand is called the *manus* (Latin for "hand"). (See Alsop 2001, 731.)

Finally, we need a word on coloration. The male snowy owl is effectively all-white, so its color is affected by light. The Dover Demon was seen in the dark and in the *yellow headlights* of the old cars. Thus, the color of that light was imparted to the feathers, rather than being the actual color of the creature Bartlett said was "peach" (i.e., the color of the yellow-to-light-orange flesh of the peach tree's fruit).

All in all, the Dover Demon proves to have been a quite terrestrial and well-documented creature, recognized at last as the somewhat exotic snowy owl. As a skeptical monsterologist of some fifty years' experience, I believe my findings will illustrate to any objective reader that "Snowy" and the "Demon" are truly birds of a feather. ■

Notes

1. I actually tentatively identified the Dover Demon as a snowy owl about 2005, approximately the time I was extensively studying the earlier Kelly, Kentucky, creatures of 1955 (see Nickell 2011, 167–173). Alas I never completed that study—misjudging the staying power of the Dover Demon tale, which has waxed and waned over the years.

2. Let me go out on a limb (sorry!) and suggest one further clue: a bit of the Dover Demon's behavior toward the eyewitnesses, especially toward John Baxter. Recall that Baxter especially (but also the others to a lesser degree) seems to have been drawn toward the creature by its own actions. Recall, too, that in no instance did it simply take flight to remove itself from a potential pursuer. Instead, it kept on the ground as if attempting to draw the person toward it. Baxter said he was uneasy about the behavior, fearing the being might be attempting to lure him, looking "as if it might be ready to spring" (Webb 1977, 48).

Strikingly, the snowy owl is known to exhibit a particular form of behavior. This is called a "crippled bird act," intended to lure a potential predator away from the owl's nest (Alsop 2001, 372). A nest would be unlikely in the Dover case, but still the act could conceivably have been practiced. (I was once given such treatment by a lakeshore bird called a Killdeer, which feigned a broken wing and, successfully, drew me to follow it for a distance of several feet, then, suddenly was "healed" and flew away! I still regard it as one of the most intriguing things I have seen in nature [Alsop 2001, 233].)

References

Alsop, Fred J. III. 2001. *Smithsonian Handbooks: Birds of North America, Eastern Region*. New York, NY: DK Publishing.

Associated Press. 1977. Teeners report 'creature.' *Bangor Daily News* (May 16): 5. Quoted in Radford 2023, 32.

Bannick, Paul. 2020. *Snowy Owl: A Visual History*. Seattle, WA: Mountaineers Books.

Blackman, W. Haden. 1998. *The Field Guide to North American Monsters*. New York, NY: Three Rivers Press.

Bull, John, and John Farrand Jr. 1994. *National Audubon Society Field Guide to North American Birds: Eastern Region.* New York, NY: Alfred A. Knopf.

Coleman, Loren. 2007. *Mysterious America.* New York, NY: Paraview Pocket Books.

Kottmeyer, Martin S. 1998. Demon moose. *The Anomalist* 6: 104–110.

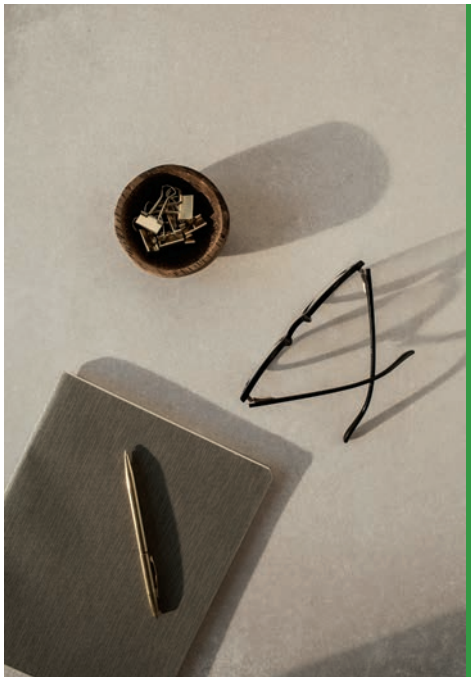
Levenson, Michael. 2023. Snowy owl awes crowds near L.A. *New York Times* (January 1).

Nickell, Joe. 2011. *Tracking the Man-Beasts: Sasquatch, Vampires, Zombies, and More.* Amherst, NY: Prometheus Books.

Radford, Benjamin. 2023. Deconstructing the Dover Demon. Skeptical Inquirer 47(1) (May/June): 31–33.

Snowy owl. 2023. Wikipedia. Online at https://en.wikipedia.org/wiki/Snowy_owl; accessed January 15, 2023.

Webb, Walter. 1977. Report on the Dover Demon (investigated with Loren Coleman, Joseph Nyman, and Ed Fogg) completed September 1977. Given in Coleman 2007, 42–56.



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[NOTES ON A STRANGE WORLD MASSIMO POLIDORO

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How Uncertainty Fosters Magical Thinking

Bronislaw Malinowski (1884–1942). Credit: Flickr commons.

Uncertainty fosters magical thinking. "Psychologically, the realization that one does not know or that one lacks certain information equals the realization that this gap in information must be filled," Leonard Zusne and Warren H. Jones wrote in the first handbook of anomalistic psychology (Zusne and Jones 1989, 13). In such cases, one experiences a state of unease and feels compelled to eliminate the uncertainty. "Magical thinking," they continue, "arises in connection with uncertainty concerning cause-effect relationships. A 'why?' question requires a 'because' answer. If the information is not available, incorrect information will be used" (Zusne and Jones 1989, 14). An answer, a solution to the uncertainty, is always needed—even if it's wrong.

Polish anthropologist Bronisław Malinowski first noted that humans resort to magical, religious, or even outright superstitious solutions if the benefit is particularly relevant (as in matters of life or death) or particularly uncertain, for example when you don't know whether it will rain on the fields or what the sex of your unborn child will be. Confined on the Trobriand Islands (now the Kiriwina Islands) in Melanesia during World War I, Malinowski took the opportunity to study the behavior of the aborigines there and noticed some very interesting facts, including the occasions when magical behavior is triggered. He noted, for example, that Trobriand fishermen did not resort to any magical rituals when they fished in shallow, safe waters, but they did resort to them when they were farther from the island in deeper waters. It is here, in fact, in those stormy, shark-infested waters that fishing really became a matter of life and death and where uncertainty was at its highest. Similarly, magical rituals appear again where aboriginal skill or knowledge cannot help, as in combating garden pests or curing disease (Malinowski 1948).

Many confirmations of Malinowski's thesis are more recent and come from industrialized societies. When Germany emerged defeated from World War I, in the face of the economic crisis that followed, there was a consistent increase in the number of articles published in German publications devoted to astrology, mysticism, and religious sects.

"Just as the Trobrianders surrounded deep-sea fishing with superstition," observed psychologists Vernon Padgett and Dale Jorgenson, "so did the Germans between 1920 and 1930 become more superstitious during the period of economic crisis" (Padgett and Jorgenson 1982). Another positive correlation has been found between the general increase in unem-

ployment between 1929 and 1975 and the surge in parapsychological publications in those same years (McCann and Stewin 1984). It is not accidental, then, that superstition and magical thinking are particularly prevalent among those activities and professions where the role of chance is greater and where the consequences of one's actions are more unpredictable, such among gamblers, soldiers, sailors, and actors (Zusne and Jones 1989, 15).

On April 12, 1961, Yuri Gagarin became the first human to orbit Earth. Before the start of his historic flight, as his bus drove him to the launch pad, Gagarin realized he had a pressing need. He asked the driver to pull over near the railroad tracks used to transport the massive rocket into position, got out, and relieved himself against one of the bus tires. Once his small mission was accomplished, he boarded the bus again and went on to complete the much larger mission of traveling to space and bringing glory to the Soviet Union. That small episode would have been forgotten except for one thing: Gagarin's flight was successful, and the cosmonauts who followed him wanted to ensure the same kind of outcome. This is why, to this day, cosmonauts flying through what is now the former Soviet Union stop on the way to the launch pad and urinate against the bus tire (Weibel and Swanson 2016). The care and attention with which this act is performed before each flight (which female cosmonauts perform with a vial of urine collected earlier) seems to indicate something beyond mere tradition.

Had Malinowski been able to study Soviet cosmonauts, he would probably have considered the bus ritual a form of magical, superstitious thinking similar to what he had seen among the tribal peoples he had studied decades earlier. The connection should come as no surprise. Just as the Trobriand fishermen risked their lives in stormy seas, the space pioneers similarly explored equally unknown and dangerous territory. Both faced risks and encountered situations over which they would have little if any control. And both resorted to magical thinking and religion to have a sense of control in circumstances in which they were essentially powerless.

Yuri Gargarin (1934–1968) in 1961. Credit: Wikimedia.

Another key aspect also emerges here. Prior to Malinowski's observations, superstition or magical thinking was thought to be characteristic of primitive, unsophisticated populations lacking scientific knowledge. As Malinowski himself noted, magical and religious thinking do not replace but instead complement scientific thinking. The Trobriand people knew how to be perfectly scientific and rational under the right circumstances. Malinowski explained that the islanders used "knowledge and work" when dealing with what he called "the well-known set of conditions" but turned to magic and religion when faced with what he called "the domain of the unaccountable and adverse influences" (Malinowski 1948, 12). The anthropologist wrote that the ability to rely on both magical and scientific thinking is characteristic of humanity as a whole and is based not so much on the categories of *primitive* and *civilized* as on the circumstances in which people find themselves living. Situations in which individuals have knowledge and control encourage scientific thinking, while more mysterious and unpredictable situations lead to magical thinking.

When faced with danger or doubt, human beings have a strong desire to react productively, even when no productive action is possible. In his book *Magic, Science, and Religion*, Malinowski explained the effect in this way: human anxieties, fears, and hopes induce a tension that drives the individual to some activity. Whether they are, as Malinowski put it in his day, "a savage being" or a "civilized one," whether they rely on magical beliefs or are completely ignorant of their existence, passive inaction—the only solution that reason suggests—is exactly the last thing that a human being can tolerate. ■

References

Malinowski, B. 1948. *Magic, Science and Religion*. Boston, MA: Beacon Press.

McCann, S.J.H., and L.L. Stewin. 1984. Environmental threat and parapsychological contributions to the psychological literature. *Journal of Social Psychology* 122(2): 227–235.

Padgett, V.R., and D.O. Jorgenson. 1982. Superstition and economic threat: Germany, 1918–1940. *Personality and Social Psychology Bulletin* 8: 739–741.

Weibel, D.L., and G.E. Swanson. 2016. Malinowski in orbit: "magical thinking" in human spaceflight. *Quest* 13(3): 53–61.

Zusne, L., and W.H. Jones. 1989. *Anomalistic Psychology: A Study of Magical Thinking*. Mahwah, NJ: Lawrence Erlbaum Associates.

[THE PHILOSOPHER'S CORNER MASSIMO PIGLIUCCI

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The Evolution of Anti-Evolutionism

Anti-evolutionism is a quintessential and particularly pernicious type of pseudoscience. Quintessential because it is both common and characterized by many of the classic hallmarks of pseudoscience. Pernicious because it directly aims at undermining both science, and education more broadly, in accordance with its religious ideological roots.

Yet, rather ironically, even anti-evolutionist tactics evolve. And even more ironically, such evolution can be documented and quantified by using the very same phylogenetic reconstruction techniques that evolutionary biologists normally employ to understand the historical relationships among biological species. A paper published a few years ago by Nicholas Matzke in *Science* is a splendid example of this approach (Matzke 2016).

Historically, in the United States there have been three major waves of creationism: (1) Bans on the teaching of evolution during the 1920s, culminating with the infamous Scopes trial in Tennessee in 1925; that wave ended in 1968, when such bans were deemed unconstitutional. (2) A shift to "balanced treatment" of evolution and creation "science," which was dealt what appears to be a final blow in 2005 in the famous *Kitzmiller v. Dover* case decided by a U.S. District Court. (3) The current wave, which can best be characterized as stealth creationism.

What Matzke did was use phylogenetic reconstruction methods applied to the wording of a large number of anti-evolution bills largely proposed after *Kitzmiller v. Dover* with the goal of reconstructing their "phylogeny"—that is, to understand how the bills are related to each other by the cultural equivalents of mutation, recombination, and common descent.

The application of evolutionary phylogenetic methods to cultural evolutionary traits is not new; for instance, research has shown congruence between the evolution of surnames and the human population genetics of the male-inherited Y-chromosome. It turns out that linguistics can benefit from techniques developed in evolutionary genetics; let's see how the same can be true for skeptical inquiries into the nature of anti-evolutionism.

The leading creationist organization in recent times has been the Discovery Institute, a "think tank" based in Seattle that promotes intelligent design (they

don't like to call it "creationism," because the term is tainted by a long history of association with religious fundamentalism). The Discovery Institute has been crippled by *Kitzmiller v. Dover*, but they managed to keep limping forward by, well, adapting their strategies to the new cultural and legal environment.

Specifically, they have developed two such strategies: bills that can be classified under the general umbrella of "academic freedom acts" (AFA) and bills that are best understood as belonging to the class of "science education acts" (SEA). These strategies have been consistently employed by anti-evolutionists and have occasionally achieved some success. The Discovery Institute, for instance, has promoted seventeen bills of the AFA type in sixteen states between 2006 and 2015, and three states—Louisiana, Tennessee, and Mississippi—have actually signed one such bill into law.

Matzke focused his analysis on text from a given bill that was simply copied into ("inherited by") another bill, or which was reused with modifications ("mutations"). Though he also found evidence of "reticulate" evolution, where bits and pieces of one bill were transferred and integrated into the context of a different bill, as if they were interspecies transfers of chromosomes.

The use of standard maximum parsimony analyses showed strong evidence for "descent with modification" across the sample of bills, while Bayesian methods identified highly likely "ancestor nodes" in the phylogenetic tree. By these means, Matzke discovered seven bills that had a disproportionate evolutionary effect. For instance, four Alabama bills introduced between 2004 and 2005 (right before *Kitzmiller v. Dover*), as well as a 2006 Oklahoma bill were the direct ancestors of the entire AFA strategy.

Matzke has also been able to identify successful "evolutionary innovations" in creationist approaches, for instance the development of the Ouachita policy of targeting for "critical analysis" not just evolution and the origin of life, but also human cloning and global warming. The Ouachita policy was apparently motivated by two factors: first, it reflects a broader anti-science consensus within the ultraconservative religious communities in the United States; second, it helps deflect the charge that previous bills were religiously motivated because they focused exclusively on evolution.

At some point, the AFA strategy has been integrated within and eventually entirely replaced by the SEA. Two Tennessee bills turned out to be pivotal in favoring the SEA strategy, becoming the direct ancestors of nine more bills produced between 2012 and 2015.

Even the overall shape of the anti-evolution phylogeny is informative. It is strongly asymmetrical, which suggests that certain bills have been disproportionally selected as ancestors of new ones, due to some characteristic judged to be particularly successful. When this happens in nature, the result is the rapid spread of evolutionary innovations. In the case of anti-evolutionism, it is the rapid spread of bills that more effectively undermines science education.

The reason this kind of stealth creationism has proven somewhat effective is that legal challenges of the bills have been made difficult by three specific tactics implemented by the Discovery Institute and their supporters: vague wording of the bills themselves, avoidance of any direct religious reference, and an insistence on permission (instead of requirement) to disparage evolution to be given to teachers when they tackle the subject in the classroom. And of course, the conduct of individual teachers can only be challenged administratively or in a court of law if a student or parent complains, which is unlikely in most Southern and Midwestern states because of peer or societal pressure, or simply because the parents themselves are creationists.

The good news is that according to Matzke, the Discovery Institute "brand" has been greatly damaged by *Kitzmiller v. Dover*, so legislators have shied away from it, focusing instead on modifying and further propagating the language of existing bills. It is also good news, I propose, that the three waves of anti-evolutionism we have seen so far have gradually reduced the scope of their ambitions: initially the teaching of evolution was to be prohibited entirely; then they retreated to "equal time" for both creationism and evolutionism, thus conceding the teaching of the latter; and now they are reduced to stealth action that attempts—however clumsily—to disguise the real nature of these legislative efforts.

Setting aside the delicious irony that allows scientists to use evolutionary analysis tools to track creationist efforts, the lesson here is that this particular culture war is waged over the very long run, and therefore constant vigilance on the part of skeptics is required. I understand and sympathize with the notion that creationism, homeopathy, astrology, UFOs, and the like are "old news" and that it is much more fun to focus our skeptical inquiries onto new types of nonsense, such as vaccine denialism, climate change denialism, novel conspiracy theories, and so forth.

But the reality is that we ought to find room to fight both old and new nonsense, because both kinds are here to stay. Indeed, nonsense has always been here. Marcus Tullius Cicero, the Roman advocate, statesman, and philosopher who was a contemporary of Julius Caesar, wrote a book two millennia ago titled *On Divination*. It is the first known full-length treatment of what we today call pseudoscience, and I'll return to it in a future column. As you can see, nothing new under the Sun.

The reality is that we are locked in a perennial battle. Sometimes we make progress; sometimes we are forced to retreat. What's the point then? I take inspiration and comfort from a metaphor used by Carl Sagan in his classic *The Demon-Haunted World*. The subtitle of that book is *Science as a Candle in the Dark*. We are, have always been, and will probably always be surrounded by the dark. Our job is not the likely impossible one to vanquish the darkness and bring the light everywhere. It is, rather, the more modest but crucially important goal of keeping the light of reason on for the benefit of future generations. ■

Reference

Matzke, N.J. 2016. The evolution of anti-evolution policies after *Kitzmiller v. Dover*. *Science* 351(6268): 28–30.

[BEHAVIOR & BELIEF STUART VYSE

Stuart Vyse is a psychologist and author of *Believing in Magic: The Psychology of Superstition*, which won the William James Book Award of the American Psychological Association. He is a fellow of the Committee for Skeptical Inquiry.

Can We Trust Peer Review Journals?

In January 2023, I received an email from an editor at the journal *Frontiers in Marine Science* inviting me to join the editorial board: "Having looked at your research, we think you could make an excellent addition to our editorial board." This was quite flattering, but if they had actually looked at my research, they might not have made this invitation. I have published a couple of dozen peer-reviewed research articles, and I have served on the editorial boards of a few peer-reviewed journals. But there is one problem: I have never studied marine science or published anything on the topic.

I could think of one possible explanation for this error: I have an unusual name, and by coincidence, elsewhere in the world there is a scientist with the same given and surname (though not the same middle name) who publishes in the hard sciences (though not marine science). Despite this coincidence, the invitation from *Frontiers in Marine Science* does not reflect a very thorough review of the people selected for the editorial board of this journal—to say the least. To make matters worse, back in July 2022, another Frontiers journal, *Frontiers in Earth Science*, invited me to be a "review editor." You guessed it—everything I ever knew about Earth science I learned fifty years ago in high school and have forgotten since.

Frontiers Media is a publisher of peer-reviewed open access scientific journals. According to their website, they currently publish 196 journals, most with titles beginning with "Frontiers in." The Frontiers journals have been involved in several controversies, but Frontiers is just part of the larger problem of open access publishing. Before I go further, some academic publishing background is required.

frontiers

On Mon, 16 Jan 2023 at 09:20, from marinescience.editors@frontiersin.org
Dear Dr. Vyse,

My name is [redacted] and I work for *Frontiers in Marine Science*. With an Impact Factor of 5.247, a CiteScore of 5.2, and over 62,600 citations, we are now one of the field's top gold open-access journals.

Having looked at your research, we think you could make an excellent addition to our editorial board. This is an opportunity to collaborate with leading experts in the field and shape the editorial content for the journal.

As the third most-cited academic publisher, editorial boards at Frontiers are a great way to increase the visibility of your work. All of our content is accessible free-of-charge and without a subscription paywall to a global audience.

If you have any queries or questions, please do not hesitate to get in touch. I look forward to hearing your thoughts on this opportunity.

Kind regards,

[redacted]
--
[redacted]
Editor Outreach Manager
Frontiers
Where scientists empower society

Two Models of Science Publishing

The business plan of traditional science publishing is based on subscriptions. Indeed, it is a somewhat unique arrangement that does not exist in any other media segment. Imagine, for example, a newspaper for which the reporters and editors worked for free, and to read their own work, they had to buy the paper. That is not far from the truth of the traditional science publishing business model. Today, scientists write grants to get funding for their research, then they conduct the research, analyze the data, and write it up. When they submit the manu-

Science Publishing	Subscription Model	Open Access Model
Subscription Fees	YES	NO
Paywalled Access	YES	NO
Article Processing Fees	NO	YES
Peer-Reviewed	YES	YES, BUT…

script to a journal for possible publication, other scientists perform the peer review—for free. Reading submitted manuscripts and writing reviews is considered a "professional service." Finally, if the article is accepted for publication, the authors of the article might get a PDF or a free copy of the journal issue, but the publisher retains the copyright of the article and is free to sell the work on a subscription basis to university libraries all over the world. In addition, the publisher can sell individual PDF copies through its website. A copy of the ten-page article in the *Journal of Clinical and Consulting Psychology* based on my dissertation research will set you back $17.95 (Vyse and Rapport 1989). I make nothing on that. Meanwhile, the author is typically prohibited from posting a copy of the article online.

This business model has served the five major academic publishers and several smaller ones quite well. In 2020, the total revenue of academic publishing was estimated at $19 billion, which placed it between the worldwide music and film industries. The five largest academic publishers—Elsevier, Wiley-Blackwell, Taylor & Francis, Springer Nature, and SAGE—controlled over 50 percent of the market, and Elsevier is the biggest of them all with an estimated 16 percent of the market (Hagve 2020).

When the internet came along, another business model became available: open access journals. The big appeal of these journals was that they were entirely online, and the articles were offered free to all. Given all the expensive paywalls in traditional publishing, free scientific knowledge sounded like an unalloyed good. But after several years of experience, it appears there is still no free lunch.

The open access journals use a very different business model: they get their money up front. Authors who submit their articles for possible publication pay an "article processing charge." For example, the Frontiers journals charge authors of articles that are accepted for publication as much as $3,225 to process a manuscript ("Fee policy" n.d.). This pay-to-play model makes it possible for the publishers to cover their costs and make the final product available for nothing. But when authors pay to have their articles considered for publication, it creates the possibility of general bias in favor of acceptance. Ideally, the peer review process should be a protection; this is not always the case. For example, Frontiers journals employ single-blind rather than double-blind peer review ("How we publish" n.d.). This means that the reviewers know who the authors are. As you can imagine, single-blind review opens the door to several reviewer biases based on the author's gender, nationality, or prestige of their home institution, among other things (Tomkins et al. 2017). As a result, double-blind review in which reviewers do not know who the article authors are is considered the far superior system.

Predatory Journals

There are thousands of scientific journals publishing today. Using a crude classification system, we might label them good, bad, or predatory. The term *predatory* is reserved for those journals that take the open access model even further, charging authors' fees but doing little or no peer-review. The journal might look like a legitimate outlet for scientific information, but the publishing standards are low or nonexistent. For an example of the lax standards of predatory journals, see Ramzi Hakami's article, "Predatory Journals: Write, Submit, and Publish the Next Day" in the September/October 2017 of Skeptical Inquirer (Hakami 2017).

Recently, a group of scholars came together to establish a consensus definition of a predatory journal: "Predatory journals and publishers are entities that prioritize self-interest at the expense of scholarship and are characterized by false or misleading information, deviation from best editorial and publication practices, a lack of transparency, and/or the use of aggressive and indiscriminate solicitation practices" (Grudniewicz et al. 2019, 211).

Predatory journals create two prob-

lems. First, they prey upon authors—often young and inexperienced scholars—to make money. Undergraduate and graduate students often receive emails from predatory journals encouraging them to submit their honor's or master's theses for publication. Second, predatory journals mislead the public. Unless you have a good understanding of the scientific publishing landscape, you will not be able to tell the difference between a predatory and a legitimate, high-quality journal. Agnes Grudniewicz et al. (2019) tell the story of a breast cancer patient who, after pursuing science-based treatments, turned to alternative medicine. Her alternative medicine practitioner gave her a journal article reporting that vitamin infusions were an effective treatment. But when she showed the article to her son-in-law, he recognized that it was from a predatory journal. She learned something valuable—but only because she happened to have a relative who was savvy to the academic publishing quagmire.

So how can we tell which journals are predatory and which are legit? The problem of predatory journals began to get much needed attention when Jeffrey Beall, the University of Colorado librarian who first coined the term *predatory publisher*, compiled a list of suspected predatory journals and posted it online. The validity of "Beall's List," as it became known, was supported in 2013 when the journal *Science* conducted a sting operation using a fake manuscript that was designed to have "such grave errors that a competent peer reviewer should easily identify it as flawed and unpublishable" (Bohannon 2013, 62). The article was submitted to 304 journals, 137 of which were on Beall's list. Of the journals on Beall's list that responded to the submission, 82 percent accepted the bogus paper.

Beall was pressured to pull down his website in 2017, and although the events are clouded in secrecy, Frontiers Media appears to have played a very large role in the decision. In 2015, Beall added Frontiers Media to his list of "potential, possible, or probable" predatory open access publishers, and the powerful publishing group responded.

According to a report in the *Chronicle of Higher Education*, Frontiers demanded that the University of Colorado open an investigation of potential research misconduct by Beall (Basken 2017). The university had rebuffed several previous publisher's complaints about Beall's list, but when faced with a much more aggressive assault by Frontiers Media, the university eventually acquiesced. Beall immediately took down his list, and the investigation eventually found no fault and took no action against Beall.

Although Beall has not returned to his work on this topic, an anonymous individual archived the list of potential predatory journals and has posted it online (https://beallslist.net/). Unfortunately, the remaining list is static, and for understandable reasons no one has come forward to take up where Jeffrey Beall left off. Meanwhile, the panoply of Frontiers journals continues to publish unabated, and they have racked up an impressive number of retracted articles. Academic publishers retract journal articles when it has been discovered that they have substantial errors or that the authors engaged in research fraud—the kinds of flaws that good peer review often catches. In January 2022, *Retraction Watch* (https://retractionwatch.com/), a website that monitors retracted journal articles, ran an article titled "Frontiers Retracts a Dozen Papers, Many More Expected" (Oransky 2022).

Caveat Emptor

So, what is the consumer of science information supposed to do? Unfortunately, there is no good answer to this question. The old Beall's list is on the internet, but it isn't being updated. Few nonscientists even know about open access publishing, much less how to tell the difference between legitimate and questionable journals. Furthermore, the waters have gotten even muddier lately as respected traditional publishers launch open access journals. One of the most glaring examples of blurring of lines between traditional publishing and open access is the case of *Nature*.

Nature is a British science journal that began publishing in 1869 and is arguably the first or second (to *Science*) most prestigious place for scientists to publish their work. Throughout its history, *Nature* has used a traditional subscription-based model of publishing. But in 2011, it launched *Nature Scientific Reports*, which is an open-access journal that charges authors an article processing fee of approximately $2,000 per manuscript. Officially, the journal is simply called *Scientific Reports,* but as the logo suggests, the confusion is real. For, example, see this *Yahoo! Finance* article,

"New Nature Study Concludes Rarity of Severe Chiropractic-related Adverse Events" (PR Newswire 2023). The article is about a study published in *Scientific Reports*, not in *Nature*, but the address where the study can be found is on the *Nature* website (https://www.nature.com/articles/s41598-023-28520-4).

Publishing in the original *Nature* carries enormous prestige, and although bad research and mistakes can slip through the cracks in any journal, publications in *Nature* are generally considered to be of very high quality. It is less clear how to evaluate publications in *Scientific Reports* because it uses an open access business model. Yet *Scientific Reports* probably gains some appeal from its association with *Nature*, and the greater concern, as the *Yahoo! Finance* article suggests, is that many people may not recognize that they are two different journals with very different business models.

The subscription-based publishing model has its own problems. It is frustrating that science information must be hidden behind exorbitant paywalls. But the subscription journals have some qualities that help them conduct more objective and rigorous peer reviews: the absence of a pay-to-play system and—in the best cases—double-blind review. By far the more difficult problem in the long run is media literacy. Journalists and consumers need to understand that not all peer reviews are the same. It is a messy and confusing landscape, but if cancer patients are going to be able to critically evaluate alternative medicine research, they can't rely on the random son-in-law who knows about predatory publishers. We all need to get better at recognizing that not all peer reviews are the same. ■

Journalists and consumers need to understand that not all peer reviews are the same.

References

Basken, Paul. 2017. Why Beall's List died—and what it left unresolved about open access. *The Chronicle of Higher Education* September 12: 3–9. Online at https://www.chronicle.com/article/why-bealls-list-died-and-what-it-left-unresolved-about-open-access/.

Bohannon, John. 2013. Who's afraid of peer review? *Science* 342(October): 60–65.

Fee policy. n.d. Frontiers Media. Online at https://www.frontiersin.org/about/fee-policy.

Grudniewicz, Agnes, David Moher, and Kelly D Cobey. 2019. Predatory journals: No definition, no defence. *Nature* 576: 210–12.

Hagve, Martin. 2020. The money behind academic publishing. *Tidsskrift for Den Norske Legeforening* 140(11): 1–5.

Hakami, R. 2017. Predatory journals: Write, submit, and publish the next day. Skeptical Inquirer (September 1). Online at https://skepticalinquirer.org/2017/09/predatory-journals-write-submit-and-publish-the-next-day/.

How we publish. n.d. Online at https://www.frontiersin.org/about/how-we-publish.

Oransky, I. 2022. Frontiers retracts a dozen papers, many more expected. *Retraction Watch* (January 12). Online at https://retractionwatch.com/2022/01/11/frontiers-retracts-a-dozen-papers-many-more-expected/.

PR Newswire. 2023. New nature study concludes rarity of severe chiropractic-related adverse events. *Yahoo! Finance* (February 6). Online at https://finance.yahoo.com/news/nature-study-concludes-rarity-severe-120000794.html.

Tomkins, Andrew, Min Zhang, and William D. Heavlin. 2017. Reviewer bias in single- versus double-blind peer review. *Proceedings of the National Academy of Sciences of the United States of America* 114(48): 12708–13.

Vyse, Stuart A., and Mark D. Rapport. 1989. The effects of methylphenidate on learning in children with ADDH: The stimulus equivalence paradigm. *Journal of Consulting and Clinical Psychology* 57(3): 425–435.

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[THE PRACTICAL SKEPTIC MICK WEST

Mick West is a writer, investigator, and debunker who enjoys looking into the evidence behind conspiracy theories and strange phenomena and then explaining what is actually going on. He runs the Metabunk forum, tweets @mickwest, and is the author of the book *Escaping the Rabbit Hole*.

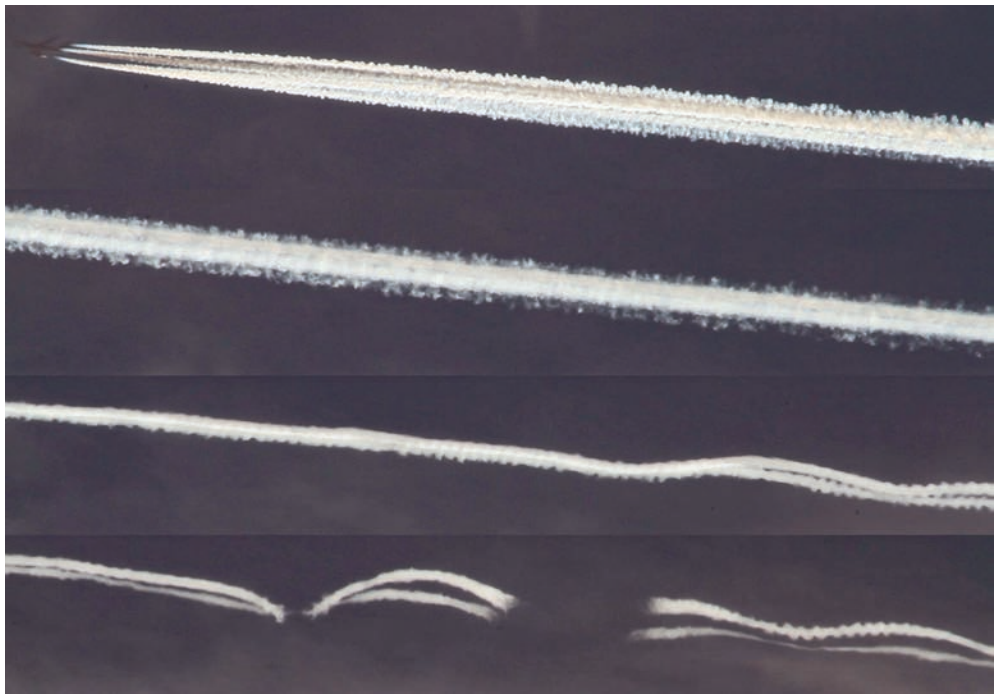
Inventing Skeptical Language

Language is shorthand. We use words to signify complex concepts that are mutually understood. The word *car*, for example, is easily comprehended by all people in a conversation because we've all seen cars, have been in cars, and many of us have driven a car. This shared lexicon makes communication easy because we can convey quite complex concepts in just a few words, sometimes just a single word.

The need to convey complex concepts often arises in my practical skeptical activity. The same false beliefs and misunderstandings come up again and again, so I find myself giving the same explanations again and again. Sometimes I'm trying to explain an existing phenomenon that does not have a common descriptor. Sometimes I'm presenting an idea of my own that does not yet have a name.

The lack of a straightforward word introduces a lot of friction into a conversation. Instead of simply using shorthand, such as *car*, you are forced to laboriously reexplain things, often having to come up with a clumsy extended description because a shorthand is not agreed upon. Imagine talking about a car race as "a contest using wheeled conveyances driven by an interesting mechanical device that efficiently burns a distillation of petroleum in a way that creates motion."

Having to spell things out in skeptical conversations has the obvious practical downfall of simply taking longer. But more significantly, it prevents efficient thinking about the topic. Mentally, you, or your friend in conversation, must process all these additional descriptions every time to understand a concept and then build on it. It would be so much more efficient if the concept were already understood.



The evolution of a hybrid contrail—something described in science but with no name.

So I recommend something that has worked for me over the years: inventing new words and encouraging, even forcing, their adoption.

Hybrid Contrails

One of the first times I invented a new word, specifically for skepticism, was back when I was investigating the chemtrails conspiracy theory. This theory suggests that some of the long trails left behind by planes in the sky (contrails) are a form of covert spraying of some substance for nefarious purposes.

The theory was surprisingly popular (and seems to be making a comeback in 2023) partly because contrails are things that people are generally oblivious to, just another type of cloud in the sky. The problem with that is that when you look closely at contrails, they can look really strange.

One industrious chemtrail conspiracist had trained his zoom lens on a contrail and noticed something odd. Inside the normal trail, there were two smaller trails. These smaller trails seemed denser than the main contrail. As he videoed the changes in the trail after the plane had passed, he noticed the small trails lasted much longer than the main contrail and formed into odd-looking loops.

The obvious conclusion to him was that these were being separately sprayed from nozzles on the plane's wings, which is why they were acting differently.

After some observations of similar trails myself, I determined that what he was seeing was actually the wingtip vortices that a plane naturally leaves behind. This was creating two rotat-

ing tubes of low-pressure air in which some of the normal contrails were captured. The different conditions inside these vortex tubes meant that we ended up with these strange-looking dense smaller contrails.

I did a bit more research and found these trails were actually described in the literature on clouds (Scorer 1972, 126). The problem was they did not have a name; they were simply described as "exhaust from the engines [that] enters the cores of the vortices and the cloud persists in the low-pressure regions only."

So I decided this type of contrail needed a name, and I hit upon *hybrid contrail* because its formation depends on two types of contrail: exhaust and aerodynamic. This simplified things greatly, so I wrote up a page describing what a hybrid contrail was (West 2013). Then whenever someone brought up these suspicious inner contrails, I could simply say, "That's a hybrid contrail."

Adoption of this term was mostly limited to skeptics discussing the topic, but it was still very useful as shorthand for a quite complex physical phenomenon that continues to arise in discussions of chemtrail conspiracy theories.

A UFO in the LIZ (left) and brought out of the LIZ by using a much better camera.

Into the LIZ

My most successful bit of invented language is an acronym: the LIZ, which stands for *low information zone*. It's a word I specifically invented to help convey a concept to the UFO community.

Let me first give you a dictionary definition:

> LIZ or "low information zone" refers to the distance or set of circumstances at which UFOs are recorded when the resulting eyewitness account, image, or video contains insufficient information to identify them, even as non-human craft.
>
> Historically, UFOs have stayed at just the right distance so that they can't be identified. Hence, in photos or videos they appear as fuzzy blobs or points of light. Even more curiously this distance seems to vary by if the viewer has a camera and then by the quality of the zoom lens on that camera. With better cameras and better lighting conditions, the UFOs get further away.
>
> The ability of UFOs to stay in the LIZ has led many to conclude that UFOs are mostly, or entirely, identifiable object like planes, birds, and balloons, and that the reason that UFOs are all in the LIZ is because if they were closer, or had better lighting or focus, then they would be identified and not be UFOs.
>
> The term was coined by UFO skeptic Mick West in September 2019.
>
> UFO Enthusiast: We have thousands of videos of UFOs
>
> UFO Skeptic: Any that are not in the LIZ?
>
> UFO Enthusiast: Well, no, but there's so many of them!

You might recognize that this dictionary format is not from Merriam-Webster or Oxford but rather from the less illustrious Urban Dictionary, an online database that seeks to document the oddities of language usage on the internet, often with a humorous example. But it's a start. I know it's something of a long shot, but it's not impossible that my invented word might end up in a real dictionary one day.

The usage of a word is the definition of that word. If enough people use a word in a certain way, then that becomes the acceptable meaning of that word. The word *literally* now (much to the disgust of language purists) also has a meaning equivalent to "figuratively." Because if enough people say, "I'm literally dying from laughter right now" without actually dying, and we know what is meant, then that's what the word means—so it's in a dictionary. Here's the second definition of *literally* in Merriam-Webster:

> 2 : in effect : VIRTUALLY—used in an exaggerated way to emphasize a statement or description that is not literally true or possible.

I mention this because I know there will be some resistance in the skeptical community to inventing language. Many of us are skeptics in part because the idea of incorrect things being passed off as correct is irritating to us. Using a word not yet in the dictionary just seems wrong. An artificial, deliberate neologism might feel especially wrong, almost fraudulent.

But from a practical perspective, we cannot wait for useful words to arise naturally. Most new words are, at some point, deliberate inventions. If there's a need for a new word, then there's nothing wrong with creating one to fill that need. The problem is, how do you get people to start using it?

LIZ was coined in 2019, just four years ago. At that time, I'd been seriously looking into UFOs for two or three years, and, like most people, I'd recognized the truth behind the old joke about UFOs and cameras, which goes something like "Look, a UFO, let me get my worst quality camera."

The joke illustrates a sad reality in UFOlogy: UFO photos, like Bigfoot

photos, are invariably blurry. This blurriness has remained remarkably invariant over the decades, despite the vast increase in the quality of casual cameras and the even larger increase in the number of cameras that people carry around with them regularly.

The persistent blurry photos and video are at odds with eyewitness accounts, which often describe looking at a detailed craft, even with occupants, sometimes in broad daylight. Given that the resolving power of a modern cell phone camera now often surpasses the resolving power of the average human eye, the images captured should be *better* than the descriptions, not worse.

This observation was something that UFOlogists were painfully aware of and have even tried to sweep under the rug by inventing their own language of distinguishing UFO "observables" such as "high speed." The fourth observable, they claim without irony, is *low observability*. Yes, many UFOlogists adopt the Bigfoot defense—that UFOs are naturally blurry and hence appear so on camera. This, of course, does not explain why people can see them clearly.

The idea of the LIZ is to provide shorthand for an explanation for why there are no good photos. By creating the familiar image of a "zone" at a certain distance where UFOs are invariably found, it raises the question of why UFOs stay in that zone when a camera is present. It also raises the natural question of what happens when the UFO comes out of the zone or that zone is pushed back by zooming in or picking up a better camera.

What happens is that whatever UFO was in the LIZ is now discernible and is resolved as an ordinary object such as a balloon, bird, plane, or any of the many normal things that get misidentified as a UFO.

We see this happen time and again. In the LIZ, there's low information; UFOs can exist. Outside the LIZ those UFOs are invariably identified, IFOs, never anything interesting and certainly never anything alien-like.

With this new and easy way of thinking about the situation that our shorthand allows, it becomes easier to then convey the idea that we're looking at a statistical sampling of UFOs in the LIZ. Every single one that emerges from the LIZ is resolved, so we can extrapolate this to those that remain.

The adoption of "the LIZ" by the UFO community was achieved by simple repetition. I interact with them on social media and would say things such as, "That's in the LIZ." At first, people would ask me what it meant, and I'd explain. Then other people started to explain it for me. Then UFOlogists started to use "the LIZ" in conversations among themselves.

I'd also used it in my writing, including here in Skeptical Inquirer (e.g., November/December 2021) and in interviews with mainstream publications such as *Scientific American* (Mann 2021). The more it is used, the more usage becomes normalized. A poll of my Twitter followers suggests that a third of them understand what "the LIZ" means.

The familiarization of the community with this new word allows the rapid raising of the issue of why UFOs *invariably* resolve into mundane objects when more data is added. Have the aliens just had an amazing run of luck, or is the LIZ sadly devoid of intelligent life? ■

References

Mann, Adam. 2021, Avi Loeb's Galileo Project will search for evidence of alien visitation. *Scientific American* (July 27). Online at https://www.scientificamerican.com/article/avi-loebs-galileo-project-will-search-for-evidence-of-alien-visitation/.

Scorer, Richard. 1972. *Clouds of the World: A Complete Color Encyclopedia*. Mechanicsburg, PA: Stackpole Books, 126.

West, Mick. 2013. Hybrid contrails, a new classification. Online at https://contrailscience.com/hybrid-contrails-a-new-classification/.

[SKEPTICAL INQUIREE BENJAMIN RADFORD

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Skepticism, Certainty, and the Psychology of Experience

Q: **How should I interpret the many sincere and detailed reports of people who believe they have experienced something paranormal or unexplainable? What is the right way to think about it?**

—R. Kuznetsov

A: This question is at the heart of many paranormal believers' claims and experiences. It's basically valuing the primacy of personal experience and anecdote over other forms of knowledge. The evidence for most paranormal topics comes down to personal experience and anecdote. After all, if there were clear, obvious, and incontrovertible evidence for Bigfoot, ghosts, psychic powers, or the countless other subjects that populate this magazine, then everyone would agree. There would be no debate about the existence of the phenomena, because—like zebras, electricity, sticky toffee pudding, and everything else that's known to exist—researchers could offer plenty of forensic (and falsifiable) evidence about them.

Many people's faith in eyewitness experience is profound and unshakeable. After all, they (believe) they correctly interpret their daily experiences. They may admit to being fooled by standard optical illusions and misremembering or forgetting minor things, of course. But when it comes to experiences (either their own or others') of amazing events such as seeing a UFO, ghost, or Bigfoot, they can't see how anyone could be mistaken (and they can't all be lying!).

For example, monster researcher Linda Godfrey's book *I Know What I Saw: Modern-Day Encounters with Monsters of New Urban Legend and Ancient Lore* contains dozens of reports (many of them sparsely detailed, anonymous, unconfirmed, and poorly sourced) of people who—as promised—claim they "know what they saw." Except even a cursory reading clearly contradicts both the book's title and premise: they *don't* know what they saw at all. They saw (or at least reported) *something* weird: perhaps a Bigfoot, Goat-Man, werewolf, or "phantom quadruped." If they really "knew what they saw" then—like UFO reporters who "really knew what they saw" (e.g., Venus, commercial aircraft from odd angles, Starlink satellites, etc.)—then the book would (with diligent investigation) be mostly about mundane animals.

Psychological Perspectives

This issue is fundamentally a psychological one and requires recognition that there are many sources of error and ways people can misunderstand what they experience. Personal perception and experience tells us that our planet revolves around us. The Sun moves across the sky from east to west, while we don't appear to be moving at all. But personal experience is of course wrong; it is instead Earth that revolves around the Sun. Science reveals that the earth we walk on is also revolving at over 1,000 miles per hour (at the equator), contrary to personal experience.

What we believe affects us in ways we might not even realize. Psychological studies have repeatedly borne this out, for example in studies of alcohol placebos. People who imbibe drinks they believe contain alcohol (but do not) act as if they are intoxicated. In one study of memory recall, a large group of people were given tonic water, but half of them were told it contained vodka. All were shown a film of a staged crime and were read an inaccurate summary of what happened in the film. Completely sober subjects who believed they had been drinking liquor showed much higher incidence of false recall of the information than did those who thought they were sober (Assefi and Garry 2003). If you *think* you are drunk or tipsy, you will act drunk or tipsy. This isn't magic or mind control over reality but mind control over perception. But the same principles apply to the paranormal and New Age to make individual realities become "real."

Understanding human psychology is of great benefit in paranormal investigation, in part because often there is little hard evidence. "I saw a ghost," one young woman told me during an investigation, or "I think I have psychic powers because my dog can read my mind," as one fourteen-year-old Canadian boy emailed me. Unless there is some sort of supporting evidence or proof, these are not reports but instead *interpretations of experiences*.

There's nothing wrong with personal experiences, but by themselves they are not proof or evidence of anything except that the person experienced something they didn't understand or couldn't immediately explain. Most people who report such experiences are being truthful (i.e., not hoaxing), but being truthful is not the same as being accurate.

The Fallible Path from Experience to Report

Let's take a more granular approach. For a person to accurately and fully report an experience, they must do four basic things correctly: 1) *perceive* the phenomena; 2) *interpret* the phenomena; 3) *recall* the phenomena; and 4) *describe* the phenomena.

For example: A man on a boat in a lake sees something big and dark rise out of the water. When he gets to shore, he tells his wife he saw a lake monster.

Maybe he did or maybe he didn't, but some questions must be asked:

1) How accurate is his perception? How good is his vision? What were the lighting conditions: bright daylight, dusk, or nighttime? How far away was it? Ten feet? 100 yards? A quarter mile?

2) How good is his interpretation? Why did he interpret what he saw as specifically a lake monster instead of a fish, wave, or sunken log? Did it have characteristics that convinced him it could not be something ordinary? Were there any other factors that might influence his interpretation or judgment (for example, alcohol or other drugs, health problems such as diabetes, exhaustion)? Had he reported seeing the monster before or been told about the creature? Was he actively searching for the monster (suggesting that psychological priming might be at work) or doing some other activity such as fishing?

3) How good is his recollection? Did the incident happen just minutes or hours earlier? Or was it reported weeks, months, or even years later? Does he have any memory problems? Has he told the same story before? If so, are the accounts different? The more often a person repeats a story, the more likely it is to have been embellished; details creep in or drop out over time.

4) How good is his ability to adequately report or describe his experience? How extensive is his vocabulary? Does he speak the same language as the person he's reporting his experience to? Is he too frightened to speak? Are there any other factors that might affect his ability to fully communicate or articulate what he experienced?

The same basic questions apply to all eyewitness experiences. Note that an eyewitness's account can only be considered completely valid if the person is not affected by factors such as these. If he clearly sees the object and correctly identifies it at the time but can't correctly recall or describe it later, then the sighting is compromised. If any part of the chain breaks down, if any one of these steps is dubious or missing, then there will be serious errors and mistakes in what is reported. This of course doesn't mean that all eyewitnesses are unreliable, just that investigators cannot take reports at face value. In our daily lives, any errors that creep into the cognitive process are likely to be minor and insignificant. But in alleged eyewitness accounts of paranormal phenomenon, every detail may be important. The gap between what is experienced and what is reported can create monsters and mystery where none exist. For an excellent overview, see *Anomalistic Psychology: Exploring Paranormal Belief and Experience* by Christopher French and Anna Stone.

As any experienced investigator will tell you, most eyewitnesses are sincere. They are neither lying nor hoaxing—and neither are they crazy or stupid. They're just like the rest of us, and if there's one thing that skeptical investigation can draw from psychology, it's that anyone can be fooled. Recognizing this often results in a sort of skeptical humility. While skeptics are often portrayed as being arrogant and dismissive, it's often paranormal believers and eyewitnesses who are so absolutely certain that they "know what they saw" and can't be wrong. ■

Reference

Assefi, Seema, and Maryanne Garry. 2003. Absolut memory distortions: Alcohol placebos influence the misinformation effect. *Psychological Science* 14(1): 77–80.

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The Future is what You Make of it.

While it is impossible to know or control what happens in the future, you can have security about achieving your ultimate goals by making a plan.

Planning is one way to create a secure future for you and your loved ones. With a good plan, you can rest easy knowing that your family will be well cared for and your property will pass to your intended beneficiaries.

What are some options for planning my future?

A Will

A will is a written document that permits you to state how you want your property or estate distributed, name an executor (also called a personal representative) to distribute your property, pay debts and taxes, and handle other business affairs to settle your estate.

Living Trust

If you own property, you may wish to set up a living trust. A living trust may be set up during life and directs where your assets go. Unlike a will, a trust will not subject your estate to probate, which is often a lengthy and costly process that requires a court to settle your estate.

What other considerations need to be made?

Who will be the guardian of my dependent children?

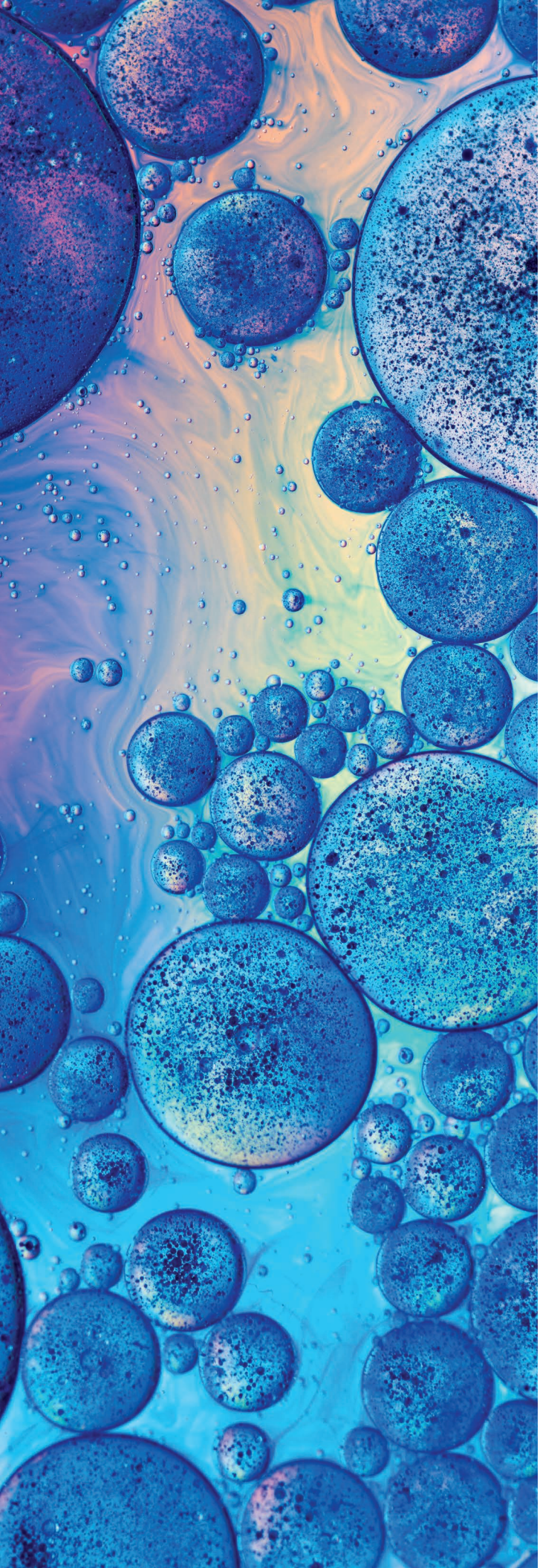
Your child is considered a minor in most states until he or she reaches age 18. It is important to appoint a guardian, so that if you pass away, the guardian may take physical custody of and care for your minor children.

Who will have the power to manage my finances?

If you are no longer able to manage your property or later wish to have someone else manage your property, a durable power of attorney will give the person you select the legal authority to buy, sell, and manage your property.

Who will make my healthcare decisions?

A durable power of attorney for healthcare allows you to select a person who can assist your doctors in making healthcare decisions if you become unable to act on your own behalf.



The Ideological Subversion of Biology

New dogmas pose a grave threat to science by forcing reality to conform to progressive politics and morals.

JERRY A. COYNE AND LUANA S. MAROJA

We're all familiar with the culture wars that pit progressive Leftists against centrists and those on the Right. In the past, those skirmishes dealt with politics and sociocultural issues and in academia were restricted largely to the humanities. But—apart from the "sociobiology wars" of the seventies (Schnettler 2020) and our perennial battles against creationism—we biologists always thought that our field would avoid such struggles. After all, scientific truth would surely be immune to attack or distortion by political ideology, and most of us were too busy working in the lab to engage in partisan squabbles.

We were wrong. Scientists both inside and outside the academy were among the first to begin politically purging their fields by misrepresenting or even lying about inconvenient truths. Campaigns were launched to strip scientific jargon of words deemed offensive, to ensure that results that could "harm" people seen as oppressed were removed from research manuscripts, and to tilt the funding of science away from research and toward social reform. The American government even refused to make genetic data—collected with taxpayer dollars—publicly available if analysis of that data could be considered "stigmatizing." In other words, science—and here we are speaking of all STEM fields (science, technology, engineering, and mathematics)—has become heavily tainted with politics, as "progressive social justice" elbows aside our real job: finding truth.

In biology, these changes have been a disaster. By diluting our ability to investigate what we find intriguing or important, withholding research support, controlling the political tone of manuscripts, and demonizing research areas and researchers themselves, ideologues have cut off whole lines of inquiry. This will decrease human wellbeing, for, as all scientists understand—and as the connection between heat-resistant bacteria and PCR tests demonstrates (Yellowstone Volcano Observatory 2020)—we never know what benefits can come from research driven by pure curiosity. But nourishing curiosity has a value all its own. After all, it doesn't make us healthier or wealthier to study black holes or the Big Bang, but it certainly enriches our lives to know about such things. Thus, the erosion of academic freedom in science by progressive ideology hurts us both intellectually and materially.

Although biology has clashed with ideology at other times and places (e.g., the Soviet Lysenko affair, creationism, and the anti-vax movement), the present situation is worse, for it affects *all* scientific fields. What's equally unfortunate is that scientists themselves—helped along by university administrators—have become complicit in their own muzzling.

Here we give six examples of how our own field—evolutionary and organismal biology—has been impeded or misrepresented by ideology. Each example involves a misstatement spread by ideologues, followed by a brief explanation of why each statement is wrong. Finally, we give what we see as the ideology behind each misstatement and then assess its damage to scientific research, teaching, and the popular understanding of science. Our ultimate concern is biology research—the discovery of new facts—but research isn't free from social influence; it goes hand in hand with teaching and the public acceptance of biological facts. If certain areas of research are stigmatized by the media, for example, public understanding will suffer, and there will follow a loss of interest in teaching as well as in research in these areas. By cutting off or impeding interest in biology, the misrepresentation or stigmatization by the media ultimately deprives us of opportunities to understand the world.

We concentrate on our own field of evolutionary biology because it's what we feel most compelled to defend, but we add that related ideological conflicts are common in sciences such as chemistry (Krylov 2021), physics (Robertson and Hairston 2022), math (Pais 2013), and even computer science (Ali 2022). In these other areas, however, the clashes involve less denial of scientific facts and more effort toward purifying language, devaluing traditional measures of merit, changing the demographics of scientists, drastically altering how science is taught, and "decolonizing" science ("Decolonizing science toolkit" 2022). Evolutionary biology has been especially susceptible to attacks on scientific truth because it deals with the most fraught topic of all: the origin and nature of *Homo sapiens*. We begin with a misconception about our species that's become quite common.

1. Sex in humans is not a discrete and binary distribution of males and females but a spectrum. This statement, one of the most common political distortions of biology (e.g., Ainsworth 2018), is wrong because nearly every human on earth falls into one of two distinct categories. Your biological sex is determined simply by whether your body is designed to make large, immobile gametes (eggs, characterizing females) or very small and mobile gametes (sperm, characterizing males). Even in plants we see the same dichotomy, with pollen producing the tiny sperm and ovules carrying the large eggs. The size difference can be huge: a human egg, for instance, has *ten million times* the volume of a single sperm. And each gamete is associated with a complex reproductive apparatus that produces it. It is the bearers of these two reproductive systems that biologists recognize as "the sexes."

Because no other types of gametes exist in animals or vascular plants, and we see no intermediate gametes, there is no third sex. Although many species of animals and flowering plants have hermaphrodites (Jarne and Auld 2006), these simply combine male and female functions (and gametes) within single individuals and don't constitute a "third sex." Further, developmental issues can sometimes produce people who are intersex, including hermaphrodites. Developmental variants are very rare, constituting only about one in 5,600 people (0.018 percent; Sax 2002), and also don't represent "other sexes." (We know of only two cases of true human hermaphrodites that were fertile, but one individual was fertile only as a male [Parvin 1982] and the other only as a female [Schoenhaus et al. 2008].)

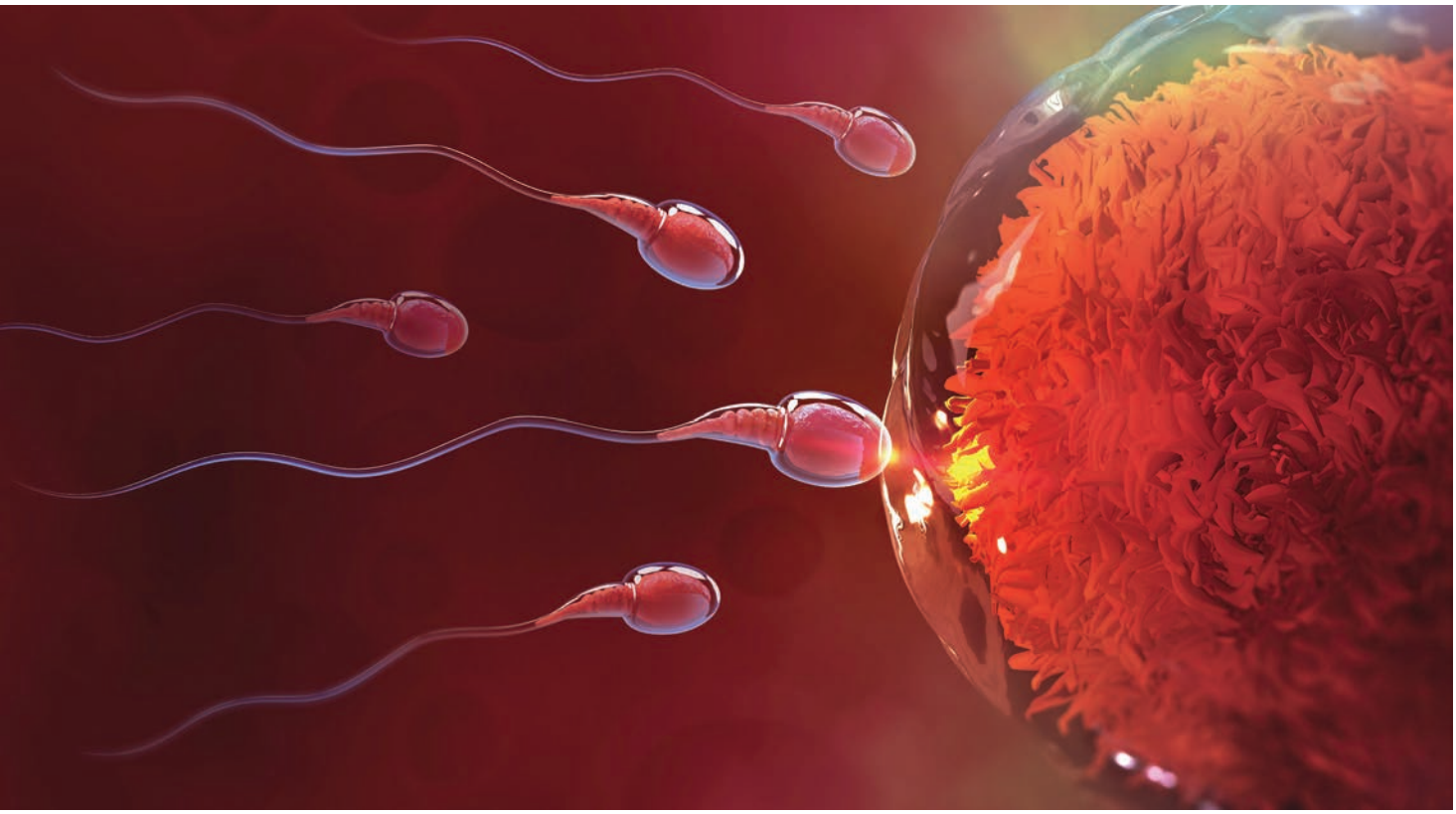
Only in protists, fungi, and algae do we find more than two distinct classes of individuals having gametes of the same size ("isogamous"), with individuals able to mate with members of any class but their own. If you relax the definition of sexes, these could be viewed as multiple sexes, but to avoid confusion biologists call them "mating types."

For all practical purposes, then, sex is a binary (Elliott 2020)—not just in humans but in all animals and plants. And it's a binary because natural selection has *favored* the evolution of a binary. In 1958, the famous evolutionist Ronald Fisher posed the crucial question: "No practical biologist interested in sexual reproduction would be led to work out the detailed consequences experienced by organisms having three or more sexes; yet what else should he do if he wishes to understand why the sexes are, in fact, always two?" (Fisher 1958, ix).

Although it's not really necessary to have two discrete gamete types to obtain the well-established advantage of sexual reproduction (McDonald et al. 2016), the evolution of the sexual binary has happened multiple times (Dacks and Kasinsky 1999; Lehtonen 2021). Both biological observation and mathematical models (Deng 2007), whose messy details we can ignore, show why the number two is ubiquitous. Beginning with an ancestral species having gametes of equal size ("isogamy"), natural selection often promotes the splitting of the population into two groups of individuals having very different gametes ("anisogamy")—either small and mobile ones or large and immobile ones. Two sexes have thus evolved, and henceforth the species will resist the invasion of individuals having other types of gametes—that is, other new sexes.

We can see the stability of the two-sex condition by realizing that what triggers the development of males versus females varies widely across species (Bachtrog et al. 2014). Different sexes can be based on different chromosomes and their genes (e.g., XX vs. XY in humans, ZW vs. ZZ in birds, individuals with like chromosomes being female in mammals and male in birds); different rearing temperatures (crocodiles and turtles); whether you have a full or half set of chromosomes (bees); whether you encounter a female (marine worms); and a host of other social, genetic, and environmental factors. Natural selection has independently produced diverse pathways to generate the sexes, but at the end there are just two destinations: males and females. And so we have an evolved and objectively recognized dichotomy—not an arbitrary spectrum of sexes.

But despite the facts, the dichotomy of sex—especially in humans—has recently come under ideologically based attacks. Even in apparently objective discussions of sex and gender, individuals are often said to have been *assigned* their sex at birth (e.g., "AFAB": assigned female at birth), as if this were an arbitrary decision by doctors—a "social construct"—rather than *an observation of biological reality*. Even the Society for the



Study of Evolution, which should know better, was swayed by ideology to publicly declare that biological sex should be viewed as a continuum (Society for the Study of Evolution 2018). Teachers have been hounded out of their jobs (Bennett 2022) and deprived of their classes (Hooven 2023) simply for declaring that human sex is binary. As we'll see, this controversy comes from a deliberate conflation of a biological reality, the sexes, with a social construct, gender.

Denying the dichotomy of sex prevents us from understanding one of biology's most fascinating generalizations: the difference between males and females in behavior and appearance. The color, ornamentation, large size, and weapons of males compared to their absence in females, a difference seen in species such as deer, birds, fish, and seals, result from *sexual selection*: the process, first suggested by Darwin (1871), in which males compete with each other for access to females. This involves either direct antagonism between males, as in the jousting of deer, or by males appealing to female preferences through their color, ornaments, and behavior. And this near-universal observation in nature ultimately comes from females investing more in reproduction than males, starting with those big and metabolically expensive eggs.

Ultimately, this puts the burden of parental care largely on females. Tied up in offspring production and rearing, females thus become the sex less available for mating, even when the ratio of males to females is 1:1. Sexual selection also explains behavior: why, in most species—including our own—males are more promiscuous than females, who are picky about their mates. For a male, fertilization involves merely expending a teaspoon or so of sperm, while for females eggs are few and expensive, pregnancy is long, and then there are those pesky offspring to tend and feed—for years in humans. Antlers, plumes, peacock's tails, elaborate male mating dances, bird songs: these and a host of other traits make sense only as the evolutionary results of having different-size gametes.

Why do so many people resist the sex binary? Because it's in their ideological interest to conflate biological sex with *gender*—one's social identity or sex role. Unlike biological sex, gender does form more of a continuum (online lists give dozens of genders). Still, gender distributions are camel's-hump *bimodal*: most people conform to male and female gender roles, but there are many more intermediates than we see for biological sex.

And why do people distort the truth? We suspect that some of those whose gender doesn't correspond to one of the two biological sexes, and their allies, want to redefine sex so that, like gender, it forms more of a continuum. While jettisoning the sex binary is meant well, it also severely distorts scientific fact—and all the evolutionary consequences that flow from that fact.

2. All behavioral and psychological differences between human males and females are due to socialization. Evolution and genetics are often claimed to play *no role* in these differences. This is the well-known "blank slate" ideology (Pinker 2002), which asserts that all humans, including males and females, are born with the propensity to behave in similar ways, and whatever behavioral or psychological differences we see among groups derive purely from socialization, including economic or environmental influences.

To a biologist, this kind of blank-slateism—which may stem partly from the Marxist faith in the infinite malleability of humans—is profoundly wrong. Multiple studies clearly show that there are *average* differences between men and women in a long list of behaviors influenced by biology (Archer 2019), including sexual interests, parental care, aggression, degree of promiscuity, risk-taking, interest in people versus things, empathy, fearfulness, spatial abilities, violence, and traits connected to social relations. It's important to realize that we're talking about *averages* here: there's a lot of overlap between the distributions of male and female behaviors, so individuals can show characteristics seen more often in the other sex. Some women, for example, are more aggressive than the average man. And we must add that socialization *is* a likely contributor—perhaps a major one—to many behavioral differences between men and women.

But can we assert that these average differences result *solely* from socialization? No. It's likely that the average differences in the behaviors listed above not only have a biological basis but an evolved and genetic one. That is, it's certain that, over millions of years, natural selection caused some behaviors of males and females to diverge. How do we know this? By using multiple criteria, including evaluating the general likelihood of an adaptive explanation; looking for behavioral parallels in other species (especially our closest primate relatives); determining whether a sex difference in behavior is ubiquitous among different human cultures, including hunter-gatherers; testing whether the behavior is influenced by reproductive hormones such as testosterone; and seeing if the behavior appears at the expected time of development. Risk-taking and male-male aggression, for example, are strongest during the peak reproductive years of young adulthood—just as we expect if these are behaviors that evolved to help men secure mates.

But to many, even suggesting a biological basis for sex differences in behavior is taboo, perceived as a kind of misogyny. A recent example is Chelsea Conaboy's declaration in *The New York Times* that "Maternal instinct is a myth that men created" (Conaboy 2022). Here she argues that well-known differences between men and women in attentiveness and behavior toward their children is due entirely to socialization. The obvious retort from biology is that while some human societies do force the burden of maternal care onto women, the greater attentiveness of mothers than fathers to their children—attentiveness triggered by cues such as hormones, lactation, infant crying, and the sight of babies—is seen not only in every human society but, more important, also in thousands of other animal species, including our closest primate relatives (Blaffer Hrdy 2000). Tellingly, these other species lack the social pressures that, to blank slaters, explain sex differences. It would be an odd coincidence indeed if misogyny and the patriarchy just happen to create a situation in humans identical to that seen in our evolutionary cousins—as well as in our more distant relatives.

The false idea that human males and females are born biologically identical in behavior and psychology is a form of what we call "biological egalitarianism." This is the view that all groups *must* be essentially the same in important aspects of their biology because if they weren't, one might be tempted to slide from nonidentity into "inequality" and from there into bigotry, misogyny, and other discriminatory behaviors. But as we'll see, there's no logical connection between what we see in nature and how we should regard the dignity, rights, and liberties of different individuals or groups. The first is a matter of reality, the second a matter of ethics—how we rationally construct morality.

3. Evolutionary psychology, the study of the evolutionary roots of human behavior, is a bogus field based on false assumptions. The biologist P.Z. Myers joined several other critics of this field (once called sociobiology) when he asserted that: "The fundamental premises of evo psych [evolutionary psychology] are false" (Myers 2013). Even social psychologists, who almost universally accept evolution itself, are far less enthusiastic about the idea that evolution explains important aspects of human psychology, social attitudes, and preferences (Buss and von Hippel 2018).

But Myers's widely accepted view is misguided (Al-Shawaf 2019), for the fundamental premise of evolutionary psychology is simply this: *our brains and how they work—which yield our behaviors, preferences, and thoughts—sometimes reflect natural selection that acted on our ancestors*. Nobody denies this for our bodies—palimpsests of once-adaptive traits that are no longer useful (wisdom teeth, tailbones, and transitory coats of hair in embryos)—but opponents of evolutionary psychology deny it for our behaviors. But there is no scientific reason for such duality. Why on earth should our bodies reflect millions of years of evolution while our behaviors, thoughts, and psychology, molded by the very same forces, are somehow immune to our past? The only way this could be true is if human behaviors lacked genetic variation, a *sine qua non* for evolution. Yet research has shown that our behaviors are among the most genetically *variable* human traits (Turkheimer 2000)!

And so the "sociobiology wars" of the seventies, launched by E.O. Wilson's eponymous book, continue under a new name, but the subject remains human exceptionalism—the view that we're somehow nearly free of the evolutionary forces that molded behavior in other species. It's true that the early days of evolutionary psychology included some "soft" research that proposed dubious and untestable adaptive hypotheses for our behavior, but now the field has reached an explanatory maturity that has to be taken seriously (Al-Shawaf 2020).

Indeed, evolutionary psychology explains, to our best knowledge, several human behaviors. These include why we favor kin over non-kin—and closer kin over more distant kin—why we mistreat stepchildren more frequently than biological children, why males are more aggressive than females, the difference in promiscuity and sexual proclivity between men and women, why men show more sexual jealousy than women, why certain facial expressions convey emotions, why we have fears of snakes and spiders and show disgust at bodily fluids, and why we hunger for sugars and fats. Indeed, some of our behaviors, like the propensity to eat things that are no

longer healthy, constitute features useful in our ancestors but now useless or even harmful.

By walling off a huge area of research and teaching that involves human nature, the ideological vilification of evolutionary psychology prevents us from understanding our own species. As two evolutionary psychologists noted, "Not a single degree-granting institution in the United States, to our knowledge, requires even a single course in evolutionary biology as part of a degree in psychology—an astonishing educational gap that disconnects psychology from the rest of the life sciences" (Buss and von Hippel 2018). Without such knowledge, we're left with "social constructs" and "societal expectations" as the sole source of our behaviors, explanations that utterly fail to explain the observed data. It goes without saying that when dealing with any human problems involving behavior, it's best to have the fullest possible explanations, both social and biological.

The dismissal of evolutionary psychology is motivated by a blank slate ideology of human nature that sees humans as almost infinitely malleable, with few genetic constraints on our behaviors. We've already mentioned that Marxism has almost certainly influenced this attitude, which arose on the Left. More reasons are outlined in Steven Pinker's book *The Blank Slate: The Modern Denial of Human Nature.* They include a disdain for biological determinism; a belief that things that can be learned, such as language, cannot *at the same time* involve capacities that have evolved; the false view that biology is destiny—that what is inherited cannot be changed—and a flat denial that biology plays a large role in human behavior, including similarities *and* differences between individuals or groups. As we'll see, studying genetic differences between individuals or groups is especially taboo, for that work is said to promote bigotry and even eugenics.

4. We should avoid studying genetic differences in behavior between individuals. The default assumption of many people, especially those adhering to blank slate-ism, is that the genetic differences between people in traits such as educational achievement, IQ, and similar traits shouldn't be studied. In some cases, the very existence of genetic differences is denied despite support from strong evidence from various lines of research, such as twin studies. Such work is thought to inevitably produce ranking of people, a promotion of bigotry, and an unfair sorting of individuals onto different educational tracks. And yet even within a single ethnic group (e.g., the American descendants of Europeans), variation in virtually every trait, be it physical or behavioral, has an appreciable genetic component. This goes for traits such as height, blood pressure, the tendency to smoke or drink, neuroticism, and cognitive abilities and educational attainment. For the last two traits, more than half the variation among individuals is based on variation in their genes (Plomin et al. 1994; De Zeeuw et al. 2015). It's important to realize, though, that these measures reflect variation *within* a population and say nothing about the basis of differences *between* populations or ethnic groups.

This kind of study has become more useful since science developed techniques to sequence the DNA of an individual's entire genome. With that information, and sequencing many individuals, you can correlate each variable DNA position (i.e., single nucleotide bases) with various traits of individuals, determining which bits of the DNA are correlated with variation in a selected trait. This kind of study (genome-wide association studies, or GWAS [Uffelmann et al. 2021]) has, for example, turned up nearly 4,000 areas of the genome associated with educational attainment (Okbay et al. 2022). Fascinatingly, many of these genes are active mainly in the brain (Lee et al. 2018). Using GWAS studies, it's now possible to make fairly accurate predictions about a person's appearance, behavior, academic achievement, and health simply by analyzing the DNA of an individual and calculating their individual "polygenic scores" based on large samples of their population. This can even be done on fetal DNA.

GWAS analysis offers many possibilities for helpful intervention, especially by monitoring individuals for health conditions they're genetically liable to develop. The usefulness of GWAS scores for educational achievement, however, is far more controversial (Coyne 2021). Although genetic differences play a role in many aspects of what we consider "intelligence," right now it's easier to equalize people's prospects via social and educational reforms than by using polygenic scores.

Yet understanding genetic variation underlying educational outcomes might one day be useful. For instance, if we discover genetic variants that respond particularly well to educational or social interventions, it might be possible to target these individuals early on. These genetic studies could help identify environmental effects as well: If two people with identical polygenic scores wind up with very different lives, how did their environments differ? This is why doing such research, despite the controversy, is still worthwhile.

Most people wouldn't object to knowing their genetic liability to develop diseases, but that doesn't extend to work on behavior and cognition. The resistance to those studies rests on a blank-slate view of human nature that rejects any genetic determinism and argues that we can almost fully overcome any genetic influences on behavior. Genetic studies of anything beyond physical traits and disease are, it's claimed, linked with eugenics and similar acts of bigotry in the past.

In fact, the fear and avoidance of behavior-genetic research is so strong that even the National Institutes of Health defines races solely as social constructs (National Human Genome Research Institute 2023) and has limited researchers' access to public, taxpayer-funded databases containing information about the genetic constitution, health, education, occupation, and income of anonymous individuals. This restriction apparently applies even to studies that don't involve differences between races, and so it appears to be the U.S. government's attempt to stifle research on behavioral genetics in general (Ritchie 2022)—especially behaviors related to academic and social success.

5. "Race and ethnicity are social constructs, without scientific or biological meaning." This is the elephant in the

room: the claim that there is no empirical value in studying differences between races, ethnic groups, or populations. Such work is the biggest taboo in biology, claimed to be inherently racist and harmful. But the assertion heading this paragraph, a direct quote from the editors of the *Journal of the American Medical Association* (Flanagin et al. 2021), is wrong.

Before we handle this hot potato, we emphasize that we prefer the words *ethnicity* or even *geographic populations* to *race*, because the last term, due to its historical association with racism, has simply become too polarizing. Further, old racial designations such as *white*, *black*, and *Asian* came with the erroneous view that races are easily distinguished by a few traits, are geographically delimited, and have substantial genetic differences. In fact, the human species today comprises geographically continuous groups that have only small to modest differences in the frequencies of genetic variants, and there are groups within groups: potentially an unlimited number of "races." Still, human populations do show genetic differences from place to place, and those small differences, summed over thousands of genes, add up to substantial and often diagnostic differences between populations.

Even the old and outmoded view of race is not devoid of biological meaning. A group of researchers compared a broad sample of genes in over 3,600 individuals who self-identified as either African American, white, East Asian, or Hispanic. DNA analysis showed that these groups fell into genetic clusters, and there was *a 99.84 percent match* between which cluster someone fell into and their self-designated racial classification (Tang et al. 2005). This surely shows that even the old concept of race is not "without biological meaning." But that's not surprising because, given restricted movement in the past, human populations evolved largely in geographic isolation from one another—apart from "Hispanic," a recently admixed population never considered a race. As any evolutionary biologist knows, geographically isolated populations become genetically differentiated over time, and this is why we can use genes to make good guesses about where populations come from.

More recent work, taking advantage of our ability to easily sequence whole genomes, confirms a high concordance between self-identified race and genetic groupings. One study of twenty-three ethnic groups found that they fell into seven broad "race/ethnicity" clusters, each associated with a different area of the world (Banda et al. 2015). On a finer scale, genetic analysis of Europeans show that, remarkably, a map of their genetic constitutions coincides almost perfectly with the map of Europe itself (Gilbert et al. 2022). In fact, the DNA of most Europeans can narrow down their birthplace to within roughly 500 miles (Novembre et al. 2008).

Of what use are such ethnicity clusters? Let's begin with something many people are familiar with: the ability to deduce one's personal ancestry from their genes. If there were no differences between populations, this task would be impossible, and "ancestry companies" such as 23andMe wouldn't exist. But you don't even need DNA sequences to predict ethnicities quite accurately. Physical traits can sometimes do the job: AI programs can, for instance, predict self-reported race quite accurately from just X-ray scans of the chest (Wawira Gichoya et al. 2022).

On a broader scale, genetic analysis of worldwide populations has allowed us to not only trace the history of human expansions out of Africa (there were several), but to assign

dates to when *H. sapiens* colonized different areas of the world. This has been made easier with recent techniques for sequencing human "fossil DNA" (Reich 2019). On top of that, we have fossil DNA from groups such as Denisovans and Neanderthals, which, in conjunction with modern data, tells us these now-extinct groups bred in the past with the ancestors of "modern" *Homo sapiens*, producing at least some fertile offspring (most of us have some Neanderthal DNA in our genomes). Although archaeology and carbon dating have helped reconstruct the history of our species, these have largely been supplanted by sequencing the DNA of living and ancient humans.

Further, there's medical value in genetic studies of populations. A fair number of genetic diseases, for example, are associated (though not absolutely) with ethnicity (González Burchard et al. 2003): maladies such as Tay-Sachs disease, sickle cell anemia, cystic fibrosis, and hereditary haemochromatosis. These associations make both diagnosis and prenatal counseling more efficient, for one can use ethnicity to focus on possible medical issues. The incidence of ailments such as heart disease, cancer, and diabetes also differs among ethnic groups, but these diseases have both genetic and environmental causes, so treating them requires considering diet and lifestyle. Still, genetic analysis of individuals and groups could help with even these complex ailments. GWAS analysis based on ethnic-specific studies, for instance, might give estimates of the risk of various illnesses by testing infants or even fetuses. If you know you're at risk, then monitoring your lifestyle can reduce the chance of getting seriously ill when you're older.

Fortunately, GWAS data for different ethnic groups are beginning to be collected, and medical researchers already recognize that studies of different ethnicities are essential to both understanding disease and reducing health disparities. This is because genetic results from one group may not generalize to results from other groups. A recent GWAS analysis of dementia (Sherva et al. 2023), for instance, discovered that some regions of the genome increase the risk in African Americans but not white Americans. This implies that some genes able to predict future dementia will differ between these groups and that possible interventions or cures might differ as well.

Finally, there are forensic reasons for associating genetics with ethnicity. These involve predicting what a perpetrator or victim might look like (e.g., facial features or the color of eyes, skin, and hair) from a sample of blood, tissue, or semen or, when using ancient DNA, predicting how ancient people might have looked. We know now, for instance, that some Neanderthals had pale skin and red hair (Ledford 2007) and that dark skin and blue eyes might have been common in European *Homo sapiens* a few thousand years ago (Katz 2018).

But the central question about genetics in the culture wars involves *behavioral* characteristics of different populations and ethnic groups, with differences in intelligence being the subject deemed most taboo. In light of the checkered history of this work, it behooves any researcher to tread lightly, for virtually any outcome save worldwide identity of populations

could be used to buttress bias and bigotry. Indeed, even writing about this subject has led to sanctions on many scientists, who have "found themselves denounced, defamed, protested, petitioned, punched, kicked, stalked, spat on, censored, fired from their jobs and stripped of their honorary titles" (Carl and Menie 2019). A well-known example is Bo Winegard, an untenured professor in Ohio who was apparently fired (Flaherty 2020) for merely suggesting the *possibility* that there were differences in cognition among ethnic groups (Winegard et al. 2020). This is why most biologists stay far away from this topic.

The taboo is not whether there are *observable differences* in IQ and life outcomes between groups, for these are well known (Roth et al. 2001) and easily measured using standardized tests (National Center for Education Statistics n.d.). Rather, the issue is what causes these disparities: genetic differences, societal issues such as poverty, past and present racism, cultural differences, poor access to educational opportunities, the interaction between genes and social environments, or a combination of the above. A few methods have been applied to this question, including adoption studies (Weinberg et al. 1992), analysis of ethnically mixed populations (Lasker et al. 2019), and GWAS. The genomic analyses have all concentrated on educational attainment—highly correlated with estimates of IQ and measures of success in life—but have focused almost exclusively on white descendants of Europeans. And the predictive power of these ethnically white GWAS scores nearly vanishes when you apply them to other ethnic groups (Okbay et al. 2022). The reason for this decay in predictability involves the genetic differences between groups, including differences between the subset of genes that affect

educational attainment, the existence of different variants of the same genes involved in both groups, or differences between groups in how genes and their variants interact with each other and the environment. The upshot is that it is not easy to translate findings from one ethnic group to another; each group needs to be studied separately.

Two other issues make it hard to analyze behavioral and cognitive differences between groups. First, these traits are usually affected by variation at hundreds if not thousands of genes spread throughout the genome. Second, those genes are *physically connected to other genes* on chromosomes. Taken together, this means that many genes for external appearance (color, facial structure, hair texture)—the very genes that give information about someone's ethnicity—are physically linked to other genes, including those for educational attainment. Because genes lying close to each other on the chromosomes are inherited together, we have no way to completely separate genes affecting appearance from those affecting educational attainment. If differences in achievement between groups come at least partly from society treating people differently when they *look* different (e.g., via bigotry and racism), then the societal effect caused by "appearance genes" is conflated with the direct effect of "academic achievement genes."

But despite the difficulty of disentangling the effects of genes and environments, there are still societal benefits to understanding genetic effects *within* different groups. For example, GWAS studies—conducted separately for each ethnicity—could illuminate whether genetic variants associated with educational outcome differ among different groups or respond differentially to environmental interventions. Imagine, for instance, a gene whose variants were associated with thyroid function. Further imagine that variants of that gene that *reduced* thyroid function, causing iodine deficiency, were associated with lower educational attainment than variants with higher expression, and that the low-iodine variants were more common in whites than in Asians. (This is not completely fanciful: iodine deficiency can reduce IQ by a full fifteen points [Qian et al. 2005], and genes might affect how well one responds to a diet low in iodine [GB HealthWatch n.d.].) A simple intervention might involve iodine supplementation in whites having "low expression" DNA variants but not in those with "high expression" variants (too much iodine is toxic). This example is not far-fetched because we know that different groups have many unique gene forms (i.e., "private alleles" [Rosenberg 2011]) that might have important effects on behavior as well as their own unique interactions with the environment.

It should be clear from this example that the reasons for studying genetic differences between ethnic groups is to boost the success of *individuals* whose DNA is known, not to rank different groups for one trait or another. But to do this boosting, we must first understand the nature of genetic differences among groups. Many objections to this kind of work vanish when you realize that while the focus is on population-specific DNA segments associated with achievement, the ultimate goal is to help each person do their best.

In our view, then, research on cognition or educational attainment *within and between groups* should not be demonized, banned, or automatically denied publication, and the data should be publicly available. It goes without saying that scientists should be cautious about such research and vigilant against its misuse or misrepresentation. But in the end, it's hard to argue with the idea that the more we understand—and that includes genetics—the more success we'll have with social policies. Indeed, there are good arguments suggesting that stifling research on IQ, or equating this research with racism, will cause more harm than good (Carl 2018). After all, political equality should be a moral imperative, not an empirical hypothesis, and ultimately the value of a human being does not and should not depend on their IQ or years of schooling.

The great evolutionary biologist Ernst Mayr stated it well:

> Equality in spite of evident non-identity is a somewhat sophisticated concept and requires a moral stature of which many individuals seem to be incapable. They rather deny human variability and equate equality with identity. Or they claim that the human species is exceptional in the organic world in that only morphological characters are controlled by genes and all other traits of the mind or character are due to "conditioning" or other non-genetic factors. … An ideology based on such obviously wrong premises can only lead to disaster. Its championship of human equality is based on a claim of identity. As soon as it is proved that the latter does not exist, the support of equality is likewise lost. (Mayr 1963)

6. Indigenous "ways of knowing" are equivalent to modern science and should be respected and taught as such. Because indigenous peoples such as New Zealand's Māori and the New World's Native Americans were the victims of colonialism, their traditional knowledge is often lauded as an alternative version of modern science—a "way of knowing" developed independently from what's called "colonialist science"

but seen by many as of equal value. In fact, the New Zealand government requires indigenous ways of knowing to be given equal status to modern science in the classroom—and to other subjects in all secondary school education (Jones 2022). South Africa is also experiencing a decolonization of biology. An article in the prestigious journal *Nature* calls for decolonizing pharmacology in that country, concentrating on local herbal remedies to "anchor the curriculum in local experience" (Nordling 2018). While this adds a home-grown flavor to learning, dropping an anchor in local experience can only divert the student from an education in modern pharmacology.

Matauranga Māori, the indigenous way of knowing in New Zealand, is a mélange of empirical knowledge derived from trial and error (including the navigational ability of their Polynesian ancestors and Māori ways of procuring and growing food) but also includes nonscientific areas such as theology, traditional lore, ideology, morality, and legend. Yet all these are considered worthy of teaching as coequal to the methods and results of modern science. Māori scholars, for example, have advanced the improbable claim that Polynesians—the ancestors of the Māori—were the first to discover Antarctica in the seventh century. This claim is surely false (Matthews 2022), probably based on faulty translation of an oral legend. In fact, Antarctica was first seen by the Russians in 1820. Nevertheless, New Zealand's Royal Society, the nation's most prestigious scientific organization, gave a $660,000 grant to the Māori to explore this bogus narrative (Royal Society Te Apārangi 2021). There's also been a revival of the traditional herbal and spiritual remedies of Matauranga Māori (Paewai 2022), which incorporate chanting as a means of healing (Robin 2022). While local remedies may occasionally be helpful, they are almost never tested using the gold standard for medicine: randomized controlled trials.

Indigenous ways of knowing usually include some practical knowledge, which includes observations about the local environment and useful practices developed over time, including, in the case of Matauranga Māori, ancient methods of navigating and the best way to catch eels. But practical knowledge is not the same as the systematic, objective investigation of nature—free from assumptions about gods and spirits—that constitute modern science. Conflating indigenous ways of knowing with modern science will confuse students not only about what constitutes knowledge but also about the nature of science itself. It is true that modern science arose in Western Europe in the seventeenth century, a time when women were denied education and most of the population was white. This situation, due to both bias and historical contingency, severely restricted people's opportunities but provides no reason to discredit science itself—the best way of generating accepted knowledge about the universe—as "Western" or colonialist. ("Western" has become a total misnomer and insults the many people throughout the world who practice the same brands of science.)

A related issue that pits indigenous culture against modern science is forensic anthropology: the study of ancient societies using human remains and artifacts. In North America, for instance, human remains, depending on where they're found,

can be claimed by Native Americans as their own, withheld from scientific study because they're seen as ancient members of modern indigenous groups. Indeed, federal law mandates the return of bones and other artifacts to the indigenous groups who claim them (National Park Service 2023). The remains must be reburied without scientific study, even if there's no clear genealogical connection between the human bones and the Native Americans linked to where the remains were found. In the case of Kennewick Man, the indigenous "scientific" claims included a Native American leader rejecting the truth that his ancestors arrived via the Bering Strait from Asia on these grounds: "From our oral histories, we know that our people have been part of this land from the beginning of time," says Mr. Minthorn. "We do not believe that our people migrated here from another continent" (Knickerbocker 2001).

One victim of this mindset is physical anthropologist Elizabeth Weiss of San Jose State, who studies 500–3,000 year old bones from California. For simply studying those remains, Weiss was demoted by her university and banned from studying her department's collection of bones (Flaherty 2022). But it's even worse: she's not allowed to study X-rays of the remains or even show *a photograph of the boxes in which they are kept*. Many other universities, such as Berkeley, are also sending back or reburying artifacts and old bones (Elassar 2022). The result: valuable human history and anthropology remain off limits because remains and artifacts are considered sacred. Clearly, the best solution would defer burial until *after* scientific study or DNA collection. The present policy simply prevents us from learning about our past.

The promotion of these other ways of knowing comes from a desire to valorize oppressed groups by holding up

much of their culture as having the same epistemic authority as science, a view that philosopher Molly McGrath called "the authority of the sacred victim" (McGrath 2021). In its secular form, this authority derives from postmodern views that science is just one of many "ways of knowing" and that the hegemony of science reflects power rather than accomplishment. This is encapsulated by the motto, espoused by some on both the Right and the Left for decades, that "science is always political" (National Academies of Sciences 2017).

Like biblical creationism, much indigenous knowledge has a substantial spiritual or theological component that comes not from evidence but from authority or revelation. To add any of this knowledge to modern science, you must first separate the empirical wheat from the spiritual chaff. This is what the nondenominational Pastor Mike Aus meant when, after giving up his faith, he described "religious knowledge" this way: "There are not different ways of knowing. There is knowing and not knowing, and those are the only two options in this world" (Aus 2015).

* * *

Nearly all the ideologically driven distortions of biology come from one mindset: radical egalitarianism. This is the view that the sexes, different ethnic groups, and, to some extent, individuals in a population are *genetically nearly identical* in behavior and psychology (though not in appearance) and that most behavioral differences are due to socialization and other environmental effects. Socialization has, for instance, become the default explanation for why there are more men than women in math and physics (and an excess of women in psychology), why males are more aggressive and females more empathic, why there are differences in achievement between individuals of different social classes and ethnicities, and why some groups are differentially represented in science and academia in general. While social influences can certainly affect these differences, the pervasive evidence for genetic influence on human differences makes it unwise to reject *a priori* the influence of hereditary factors. Nevertheless, because the biological data contradict the fashionable blank-slate ideology, its advocates are forced to render their program immune to data, which they do by *twisting the facts of biology to conform to their beliefs*.

Biological egalitarianism damages science in two ways. One is through *deterrence*: the chilling of research that prevents scientists from studying or teaching certain problems (Maroja 2022). This isn't accomplished by direct prohibition of research but by instilling fears into teachers or researchers that discourages them from working on and even discussing such topics. A few public examples are all it takes to deter many others, such as the pillorying of those who teach that there are only two sexes in humans (e.g., Carole Hooven at Harvard [Hooven 2023] and Christy Hammer at the University of Southern Maine [Bennett 2022]). Further, those who study group differences and their genetics can be simply dismissed by labeling them as sexists, misogynists, racists, or eugenicists. This has been strikingly effective, for what liberal—and most biologists are liberals—wants to be tarred with those labels? Likewise, those who refuse to accept the equivalence of modern science and indigenous ways of knowing are deemed not only racist but colonialist (McAllister 2022). Is it any wonder that teachers, researchers, and professors censor themselves on these issues?

The other damage involves *direct action*: imposing requirements or punishments on scientists whose research strays too far from biological egalitarianism. Punishments have ranged from taking classes away from professors (Jaschik 2022), making their lives so miserable that they're forced to leave academia (Wright 2018), demanding fealty to falsehoods (Morey 2022), direct firing (Winegard 2020), demanding the infusion of mythology into science (Coyne 2022b), rejecting scientific papers because their findings don't respect the "dignity and rights of all humans" ("Science Must Respect the Dignity and Rights of All Humans" 2022), withholding publicly funded data from researchers (Lee 2022), and diverting research funds to ideologically derived projects (the National Institutes of Health once adopted this plan but soon abandoned it; Kaiser 2021).

Beyond this, and beyond the scope of this piece, are the many attacks on scientific merit as an outmoded way of judging science or hiring scientists (Abbot et al. 2023). We increasingly see calls, coming mostly from the Left, to replace evaluations of merit with more "holistic" schemes that take group identity into account. This has led many universities to require prospective faculty to submit diversity statements as part of their job applications (Foundation for Individual Rights and Expression 2022), as well as eliminating the obligation for prospective students to submit scores on standardized tests such as the MCATS, SATs, and GREs, and even firing professors whose science classes are too difficult (Murphy Marcos 2022).

Science has always been subject to ideological influence and control, beginning with the Catholic Church's censoring of Galileo, whose heliocentric solar system contradicted accepted theology. And those influences have come from both the Right and the Left, including debates about evolution, vaccine efficiency, global warming, fluoridated water, and so on. But what's happening now is different. First, recent attacks on science are more general than before, involving not just single issues but spreading into every field. The biology wars, for example, now involve much more than the fact of evolution—the only real cultural battle we fought over most of our careers—and have spread to biological sex, differences between groups, the scientific language we're allowed to use (Cheng et al. 2023), the treatment of biological artifacts, and, indeed, whether there are valid ways of learning about the natural world apart from modern science. And, of course, famous biologists of the past such as Gregor Mendel (McLemore 2021), Charles Darwin (Fuentes 2021), and Aldous Huxley (Somerville 2021) are denigrated, in hindsight, as racist or sexist.

Further, the attacks on science come not just from the public, religious believers, or political authorities, as in the past, but involve scientists themselves—scientists who deem certain research taboo, restrict the availability of publicly funded data, argue that research funding should depend on merit rather than ideology, and demand that research papers should

be censored or suppressed if they might offend individuals or groups. In the case of the Lysenko affair, Soviet fiat dictated the distortion of genetics and agricultural science (Lysenko 1948), but today our own colleagues force nature into the Procrustean bed of ideology. Although scientific nonconformity may not be the life or death issue it was in Stalin's Russia (Pringle 2008), jobs and research are clearly at risk.

Why is this happening now? We suspect that the change in political climate over the past ten years, including the rapid rise of identity politics, has caused scientists on the Left—even if they mean well—to use their own fields to signal ideological virtue and membership in a political "tribe." Further, science departments have also been infected by the French postmodernism pervasive in humanities departments (Anderson 2021). When combined with the self-censorship of many researchers and teachers who fear professional damage, this poses a grave threat to science.

How, then, can we restore science to its primary mission: understanding nature and the universe? Since ideological pressure comes largely from scientists themselves, including those who dispense grant money and judge research papers, we can't count on scientific argument to solve the problem. Indeed, radical egalitarianism is itself a form of faith (McWhorter 2021), resistant to facts and rational argument. It is also a pledge of group allegiance. Steven Pinker explained how resistance to evolution did not involve rejecting scientific evidence but rather served as a badge of adherence to a religious ideology that happened to reject evolution on principle. His explanation also holds for the quasi-religious progressive ideology that is damaging biology:

> Professing a belief in evolution is not a gift of scientific literacy, but an affirmation of loyalty to a liberal secular subculture as opposed to a conservative religious one. In 2010, the National Science Foundation [NSF] dropped the following item from their test of scientific literacy: "Human beings, as we know them today, developed from earlier species of animals." The reason for that change was not, as scientists howled, because the NSF had given in to creationist pressure to bowdlerize evolution from the scientific canon. It was that the correlation between performance on that item and on every other item on the test (such as "An electron is smaller than an atom" and "Antibiotics kill viruses") was so low that it was taking up space in the test that could go to more diagnostic items. The item, in other words, was effectively a test of religiosity rather than scientific literacy. When the item was prefaced with "According to the theory of evolution," so that scientific understanding was divorced from cultural allegiance, religious and nonreligious test-takers responded the same. (Pinker 2018, 356)

So if facts won't turn the tide, what can we do?

An obvious palliative is one we've always had at hand: a form of liberal egalitarianism and morality independent of biological differences. As Pinker noted in *The Blank Slate*: "Equality is not the empirical claim that all groups of humans are interchangeable; it is the moral principle that individuals should not be judged or constrained by the average properties of their group" (Pinker 2002, 340).

We can also keep stressing that the job of scientists is to find truth, not to decide how that truth should be used by society. This is not to claim that all research is equally valuable or interesting, nor to argue that science hasn't been misused in harmful ways (Zyklon-B and nuclear weapons come to mind). But given the observation that a lot of pure research has led to discoveries that could never have been predicted, we should avoid placing entire areas of work off limits. If some people distort or misuse scientific research for ideological ends, scientists themselves should take the lead in correcting the record.

But perhaps the ultimate solution involves philosophy—emphasizing that *there is no value in looking to nature to determine which of our behaviors are good, moral, or normal.* Doing so always involves two well-known fallacies. The first is the *naturalistic fallacy*—the famous dictum that *is* does not equal *ought*, also phrased as "what is natural is what we should do." The second is the related *appeal to nature* fallacy, which argues that what is natural must be what is *good*.

Both fallacies lead to the same errors. First, if we condition our politics and ethics on what we know about nature, then our politics and ethics become malleable to changes in what we discover about nature later. For example, the observation that female bonobos rub each other's genitals as a bonding behavior has been used to justify why human homosexuality is neither offensive nor immoral. Bonobo behavior is, after all, "natural." (Similar same-sex behaviors have been reported in many species and have been used to the same end [Roughgarden 2013].) But what if *no* such behavior had been seen in any nonhuman species? Or what if the bonobo observation was shown to be wrong? Would this make homosexual behavior immoral or even criminal? Of course not, because enlightened views of homosexuality rest not on parallels with nature but on ethics, which tells us that there's nothing immoral about consensual sex between adults.

Second, we must realize that many behaviors that are "nat-

ural" because they're found in other species would be considered repugnant or immoral in our own. These include infanticide, robbery, and extra-pair copulation. As one of us wrote, "If the gay cause is somehow boosted by parallels from nature, then so are the causes of child-killers, thieves and adulterers" (Coyne 2022a). But we don't really derive our morality or ideology from nature. Instead, we pick and choose those behaviors in other species that happen to jibe with a morality we already have. (People do exactly the same thing—ignoring the bad behaviors and lauding the good ones—when they pretend to derive morality from religious texts such as the Bible.)

All the biological misconceptions we've discussed involve forcing preconceived beliefs onto nature. This inverts an old fallacy into a new one, which we call the *reverse appeal to nature*. Instead of assuming that what is natural must be good, this fallacy holds that "what is good must be natural." It demands that you must see the natural world through lenses prescribed by your ideology. If you are a gender activist, you must see more than two biological sexes. If you're a strict egalitarian, all groups must be behaviorally identical and their ways of knowing equally valid. And if you're an anti-hereditarian—a blank slater who sees genetic differences as promoting eugenics and racism—then you must find that genes can have only trivial and inconsequential effects on the behavior of groups and individuals. This kind of bias violates the most important rule of science, famously expressed by Richard Feynman: "The first principle is that you must not fool yourself—and you are the easiest person to fool."

But the greatest danger is not to the layperson's understanding of science but to science itself. The guiding principle of science—and of academic freedom, on which science depends—is freedom of inquiry. Those who place whole fields of investigation off limits, or distort scientific truth for political reasons, not only violate this freedom but deprive us of the intellectual and practical benefits that could come from pure, untrammeled research.

We aren't under the illusion that calling attention to these points, and emphasizing the fallacy of the reverse appeal to nature, will push ideology completely out of science. Progressive ideology is growing stronger and intruding further into all areas of science. And because it's "progressive," and because most scientists are liberals, few of us dare oppose these restrictions on our freedom. Unless there is a change in the Zeitgeist, and unless scientists finally find the courage to speak up against the toxic effects of ideology on their field, in a few decades science will be very different from what it is now. Indeed, it's doubtful that we'd recognize it as science at all. ■

Editor's Note: The online version of this article with links to additional sources can be found on the Skeptical Inquirer *website (https://skepticalinquirer.org/).*

References

Abbot, D., A. Bikfalvi, A.L. Bleske-Rechek, et al. 2023. In defense of merit in science. *The Journal of Controversial Ideas* 3(1): 1. Online at https://journalofcontroversialideas.org/article/3/1/236.

Ainsworth, Claire. 2018. Sex redefined: The idea of 2 sexes is overly simplistic. *Scientific American* (October 22). Online at https://www.scientificamerican.com/article/sex-redefined-the-idea-of-2-sexes-is-overly-simplistic1/.

Al-Shawaf, Laith. 2019. Seven key misconceptions about evolutionary psychology. *Areo* (August 20). Online at https://areomagazine.com/2019/08/20/seven-key-misconceptions-about-evolutionary-psychology/.

———. 2020. Evolutionary psychology: Predictively powerful or riddled with just-so stories? *Areo* (October 20). Online at https://areomagazine.com/2020/10/20/evolutionary-psychology-predictively-powerful-or-riddled-with-just-so-stories/.

Ali, Mustafa. 2022. Decolonising computing? (video) (March 3). Online at https://www.open.edu/openlearn/digital-computing/decolonising-computing.

Anderson, Stephen L. 2021. Cynical theories by James Lindsay & Helen Pluckrose. *Philosophy Now* 143 (April/May). Online at https://philosophynow.org/issues/143/Cynical_Theories_by_James_Lindsay_and_Helen_Pluckrose.

Archer, John. 2019. The reality and evolutionary significance of human psychological sex differences. *Biological Reviews* 94(4): 1381–1415. Online at https://onlinelibrary.wiley.com/doi/full/10.1111/brv.12507.

Aus, Mike. 2015. How evolution challenges Christian dogma. Spiritualcoretheory.com (March 13). Online at https://spiritualcoretheory.com/how-evolution-challenges-christian-dogma/.

Bachtrog, D., J.E. Mank, C.L. Peichel, et al. 2014. Sex determination: why so many ways of doing it? *PLOS Biology* 12(7): e1001899. Online at https://pubmed.ncbi.nlm.nih.gov/24983465/.

Banda, Yambazi, Mark N. Kvale, Thomas J. Hoffmann, et al. 2015. Characterizing race/ethnicity and genetic ancestry for 100,000 subjects in the genetic epidemiology research on adult health and aging (GERA) cohort. *Genetics* 200(4): 1285–1295. Online at https://academic.oup.com/genetics/article/200/4/1285/5936163.

Bennett, Troy R. 2022. Students demand USM replace professor for allegedly saying there are only 2 sexes. *Bangor Daily News* (September 29). Online at https://www.bangordailynews.com/2022/09/29/news/portland/usm-professor-two-sexes/.

Blaffer Hrdy, Sarah. 2000. *Mother Nature: Maternal Instincts and How They Shape the Human Species*. New York, NY: Ballantine Books.

Buss, David M., and William von Hippel. 2018. Psychological barriers to evolutionary psychology: Ideological bias and coalitional adaptations. *Archives of Scientific Psychology* 6: 148–158. Online at https://psycnet.apa.org/fulltext/2018-57934-001.html.

Carl, Noah. 2018. How stifling debate around race, genes and IQ can do harm. *Evolutionary Psychological Science* 4: 399–407. Online at https://link.springer.com/article/10.1007/s40806-018-0152-x.

Carl, Noah, and Michael A. Woodley of Menie. 2019. A scientometric analysis of controversies in the field of intelligence research. *Intelligence* 77(November–December): 101397. Online at https://www.sciencedirect.com/science/article/abs/pii/S0160289619301795.

Cheng, Susan J., Kaitlyn M. Gaynor, Alex C. Moore, et al. 2023. Championing inclusive terminology in ecology and evolution. Trends in Ecology & Evolution (in press). Online at https://www.sciencedirect.com/science/article/pii/S0169534722003597.

Conaboy, Chelsea. 2022. Maternal instinct is a myth that men created. *New York Times* (August 26). Online at https://www.nytimes.com/2022/08/26/opinion/sunday/maternal-instinct-myth.html.

Coyne, Jerry A. 2021. Can genetics help eliminate inequality? *The Washington Post* (November 17). Online at https://www.washingtonpost.com/outlook/can-genetics-help-eliminate-inequality/2021/11/17/e7767ad6-286c-11ec-9de8-156fed3e81bf_story.html.

———. 2022a. Do seahorses validate "queerness"? The naturalistic fallacy committed by the Sussex Wildlife Trust. *Why Evolution Is True* (January 21). Online at https://whyevolutionistrue.com/2022/01/21/do-seahorses-validate-queerness-the-naturalistic-fallacy-committed-by-the-sussex-wildlife-trust/.

———. 2022b. More Kiwi missteps: New Zealand tries to infuse spirituality into chemistry (and electrical engineering). *Why Evolution Is True* (December 7). Online at https://whyevolutionistrue.com/2022/12/07/more-kiwi-missteps-new-zealand-tries-to-infuse-spirituality-into-chemistry-and-electrical-engineering/.

Dacks, J.B, and H.E. Kasinsky. 1999. Nuclear condensation in protozoan gametes and the evolution of anisogamy. *Comparative Biochemistry and Physiology Part A: Molecular & Integrative Physiology* 124(3): 287–295. Online at https://www.sciencedirect.com/science/article/pii/S1095643399001178.

Darwin, Charles. 1871. *The Descent of Man*. London, UK: John Murray.

Online at http://darwin-online.org.uk/content/frameset?pageseq=1&itemID=F937.1&viewtype=text.
De Zeeuw, Eveline L., Eco J.C. de Geus, and Dorret I. Boomsma. 2015. Meta-analysis of twin studies highlights the importance of genetic variation in primary school educational achievement. *Trends in Neuroscience and Education* 4(3): 69–76. Online at https://www.sciencedirect.com/science/article/abs/pii/S2211949315000198?via%3Dihub.
Decolonizing science toolkit. 2022. Nature.com (November 2). Online at https://www.nature.com/collections/giaahdbacj.
Deng, Bo. 2007. The origin of two sexes through optimization of recombination entropy against time and energy. *Bulletin of Mathematical Biology* 69: 2105–2114. Online at https://link.springer.com/article/10.1007/s11538-007-9215-z.
Elassar, Alaa. 2022. UC Berkeley is repatriating cultural artifacts, including ancestral remains, to Indigenous tribes. CNN (October 17). Online at https://www.cnn.com/2022/10/17/us/uc-berkeley-indigenous-repatriate-cultural-artifacts-reaj/index.html.
Elliott, Zachary A. 2020. Is sex bimodal? The Paradox Institute. Online at https://www.theparadoxinstitute.com/watch/is-sex-bimodal.
Fisher, Ronald A. 1958. *The Genetical Theory of Natural Selection*. Mineola, New York: Dover.
Flanagin, Annette, Tracy Frey, Stacy L. Christiansen, et al. 2021. Updated guidance on the reporting of race and ethnicity in medical and science journals. *The Journal of the American Medical Association* 326(7): 621–627. Online at https://jamanetwork.com/journals/jama/fullarticle/2783090.
Flaherty, Colleen. 2020. Risky research. *Inside Higher Ed* (March 11). Online at https://www.insidehighered.com/news/2020/03/12/assistant-professor-says-hes-been-fired-because-he-dared-talk-about-human-population.
———. 2022. Much more than bones. *Inside Higher Ed* (February 14). Online at https://www.insidehighered.com/news/2022/02/15/anthropologist-says-shes-being-punished-views-bones.
Foundation for Individual Rights and Expression. 2022. University of Illinois at Urbana-Champaign: Faculty Up for Promotion and Tenure Must Submit Diversity, Equity, and Inclusion Statements, Affirm University Views (October 12). Online at https://www.thefire.org/cases/university-illinois-urbana-champaign-faculty-promotion-and-tenure-must-submit-diversity.
Fuentes, Agustín. 2021. "The Descent of Man," 150 years on. *Science* 372(6544): 769. Online at https://www.science.org/doi/10.1126/science.abj4606.
GB HealthWatch. N.d. Iodine. Online at https://www.gbhealthwatch.com/Nutrient-Iodine-Genes.php.
Gilbert, Edmund, Ashwini Shanmugam, and Gianpiero L. Cavalleri. 2022. Revealing the recent demographic history of Europe via haplotype sharing in the UK Biobank. *Proceedings of the National Academy of Sciences of the United States of America* 119(25): e2119281119. Online at https://www.pnas.org/doi/10.1073/pnas.2119281119#sec-3.
González Burchard, Esteban, Elad Ziv, Natasha Coyle, et al. 2003. The importance of race and ethnic background in biomedical research and clinical practice. *The New England Journal of Medicine* 348: 1170–1175. Online at https://www.nejm.org/doi/full/10.1056/NEJMsb025007.
Hooven, Carole K. 2023. Academic freedom is social justice: Sex, gender, and cancel culture on campus. *Archives of Sexual Behavior* 52 (January): 35–41. Online at https://link.springer.com/article/10.1007/s10508-022-02467-5.
Jarne, Philippe, and Josh R. Auld. 2006. Animals mix it up too: The distribution of self-fertilization among hermaphroditic animals. *Evolution: The International Journal of Organic Evolution* 60(9): 1816–1824. Online at https://onlinelibrary.wiley.com/doi/10.1111/j.0014-3820.2006.tb00525.x.
Jaschik, Scott. 2022. Professor won't be replaced for statements on gender. *Inside Higher Ed* (October 9). Online at https://www.insidehighered.com/quicktakes/2022/10/10/professor-won't-be-replaced-statements-gender.
Jones, Katy. 2022. Teaching will 'look quite different' next year as education reforms introduced. *Stuff* (December 10). Online at https://www.stuff.co.nz/national/education/130677385/teaching-will-look-quite-different-next-year-as-education-reforms-introduced.
Kaiser, Jocelyn. 2021. NIH pulls notice aimed at encouraging applications from black scientists. *Science* (October 21). Online at https://www.science.org/content/article/nih-pulls-notice-aimed-encouraging-applications-black-scientists.
Katz, Brigit. 2018. Early Briton had dark skin and light eyes, DNA analysis shows. 2018. *Smithsonian Magazine* (February 7). Online at https://www.smithsonianmag.com/smart-news/ancient-briton-had-dark-skin-and-light-eyes-dna-analysis-shows-180968097/.
Knickerbocker, Brad. 2001. Science vs. Indian tradition in 'Kennewick Man' case. The Christian *Science Monitor* (June 21). Online at https://www.csmonitor.com/2001/0621/p2s2.html.
Krylov, Anna I. 2021. The peril of politicizing science. *The Journal of Physical Chemistry Letters* 12(22): 5371–5376. Online at https://pubs.acs.org/doi/10.1021/acs.jpclett.1c01475.
Lasker, Jordan, Bryan J. Pesta, John G. R. Fuerst, et al. 2019. Global ancestry and cognitive ability. *Psych* 1(1): 431–459. Online at https://www.mdpi.com/2624-8611/1/1/34?type=check_update&version=2.
Ledford, Heidi. 2007. Some Neanderthals were red-heads. *Nature* (October 25). Online at https://www.nature.com/articles/news.2007.197.
Lee, James. 2022. Don't even go there. *City Journal* (October 19). Online at https://www.city-journal.org/nih-blocks-access-to-genetics-database.
Lee, J.J., R. Wedow, A. Okbay, et al. 2018. Gene discovery and polygenic prediction from a genome-wide association study of educational attainment in 1.1 million individuals. *Nature Genetics* 50: 1112–1121. Online at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6393768/.
Lehtonen, Jussi. 2021. The legacy of Parker, Baker and Smith 1972: Gamete competition, the evolution of anisogamy, and model robustness. *Cells* 10(3): 573. Online at https://www.mdpi.com/2073-4409/10/3/573#B38-cells-10-00573.
Lysenko, Trofim. 1948. Lysenko on the situation in biological science. Online at https://soviethistory.msu.edu/1947-2/triumph-of-t-d-lysenko/triumph-of-t-d-lysenko-texts/lysenko-on-the-situation-in-biological-science/.
Maroja, Luana. 2022. An existential threat to doing good science. *The Free Press* (November 7). Online at https://www.thefp.com/p/an-existential-threat-to-doing-good.
Matthews, Philip. 2022. Fact or fantasy? The battle over the Polynesian Antarctica discovery. *Stuff* (December 17). Online at https://www.stuff.co.nz/national/300765931/fact-or-fantasy-the-battle-over-the-polynesian-antarctica-discovery.
Mayr, Ernst. 1963. *Animal Species and Evolution*. Cambridge, MA: Harvard University Press.
McAllister, Tara. 2022. 50 reasons why there are no Māori in your science department. *Journal of Global Indigeneity* 6(2). Online at https://www.journalofglobalindigeneity.com/article/55788-50-reasons-why-there-are-no-maori-in-your-science-department.
McDonald, Michael J., Daniel P. Rice, and Michael M. Desai. 2016. Sex speeds adaptation by altering the dynamics of molecular evolution. *Nature* 531: 233–236. Online at https://www.nature.com/articles/nature17143.
McGrath, Molly Brigid. 2021. The authority of the sacred victim. *Social Philosophy and Policy* 37(2): 132–152. Online at https://www.cambridge.org/core/journals/social-philosophy-and-policy/article/abs/authority-of-the-sacred-victim/D6C58DBF423F5C2430F68A7773384471.
McLemore, Monica R. 2021. The complicated legacy of E. O. Wilson. *Scientific American* (December 29). Online at https://www.scientificamerican.com/article/the-complicated-legacy-of-e-o-wilson/.
McWhorter, John. 2021. *Woke Racism: How a New Religion Has Betrayed Black America*. London, UK: Portfolio.
Morey, Alex. 2022. University of Minnesota Medical School's updated Hippocratic Oath could raise compelled speech concerns. Foundation for Individual Rights and Expression (October 13). Online at https://www.thefire.org/news/university-minnesota-medical-schools-updated-hippocratic-oath-could-raise-compelled-speech.
Murphy Marcos, Coral. 2022. New York University professor fired after students say his class was too hard. *The Guardian* (October 6). Online at https://www.theguardian.com/us-news/2022/oct/06/nyu-professor-fired-maitland-jones-jr-student-petition.
Myers, PZ. 2013. Convergence day 1 #cvg2013. *Pharyngula* (July 5). Online at https://freethoughtblogs.com/pharyngula/2013/07/05/convergence-day-1-cvg2013/.
National Academies of Sciences. 2017. *Examining the Mistrust of Science*. Online at https://www.ncbi.nlm.nih.gov/books/NBK436747/.
National Center for Education Statistics. N.d. Achievement gaps. Online at https://nces.ed.gov/nationsreportcard/studies/gaps/.
National Human Genome Research Institute. 2023. Race. Talking Glossary of Genomic and Genetic Terms (April 4). Online at https://www.genome.gov/genetics-glossary/Race.
National Park Service. 2023. Native American Graves Protection and Repatriation Act (Getting Started) (January 30). Online at https://www.nps.gov/subjects/nagpra/getting-started.htm.
Nordling, Linda. 2018. How decolonization could reshape South African science. *Nature* (February 7). Online at https://www.nature.com/articles/d41586-018-01696-w.

Novembre, John, Toby Johnson, Katarzyna Bryc, et al. 2008. Genes mirror geography within Europe. *Nature* 456: 98–101. Online at https://www.nature.com/articles/nature07331.
Okbay, A., Y. Wu, N. Wang, et al. 2022. Polygenic prediction of educational attainment within and between families from genome-wide association analyses in 3 million individuals. *Nature Genetics* 54: 437–449. Online at https://www.nature.com/articles/s41588-022-01016-z.
Paewai, Pokere. 2022. Tohunga: rekindling the knowledge that was nearly wiped out. RNZ (November 5). Online at https://www.rnz.co.nz/news/te-manu-korihi/478095/tohunga-rekindling-the-knowledge-that-was-nearly-wiped-out.
Pais, Alexandre. 2013. An ideology critique of the use-value of mathematics. *Educational Studies in Mathematics* 84: 15–34. Online at https://link.springer.com/article/10.1007/s10649-013-9484-4.
Parvin, S.D. 1982. Ovulation in a cytogenetically proved phenotypically male fertile hermaphrodite. *British Journal of Surgery* 69(5): 279–80.
Pinker, Steven. 2002. *The Blank Slate: The Modern Denial of Human Nature*. New York, NY: Viking.
———. 2018. *Enlightenment Now: The Case for Reason, Science, Humanism, and Progress*. New York, NY: Viking.
Plomin, R., N.L. Pedersen, P. Lichtenstein, et al. 1994. Variability and stability in cognitive abilities are largely genetic later in life. *Behavior Genetics* 24: 207–215. Online https://link.springer.com/article/10.1007/BF01067188.
Pringle, Peter. 2008. Stalin vs. science: The life and murder of Nikolai Vavilov. Online at https://www.wilsoncenter.org/event/stalin-vs-science-the-life-and-murder-nikolai-vavilov.
Qian, Ming, Dong Wang, William E. Watkins, et al. 2005. The effects of iodine on intelligence in children: a meta-analysis of studies conducted in China. *Asia Pacific Journal of Clinical Nutrition* 14(1): 32–42. Online at https://pubmed.ncbi.nlm.nih.gov/15734706/.
Reich, David. 2019. *Who We Are and How We Got Here: Ancient DNA and the New Science of the Human Past*. New York, NY: Vintage.
Ritchie, Stuart. 2022. The NIH's misguided genetics data policy. *Science Fictions* (October 25). Online at https://stuartritchie.substack.com/p/nih-genetics.
Robertson, Amy D., and W. Tali Hairston. 2022. Observing whiteness in introductory physics: A case study. *Physical Review Physics Education Research* 18(1) (January–June). Online at https://journals.aps.org/prper/abstract/10.1103/PhysRevPhysEducRes.18.010119.
Robin, Audrey. 2022. Rongoā Māori. Health Navigator New Zealand (December 26). Online at https://www.healthnavigator.org.nz/health-a-z/r/rongo%C4%81-m%C4%81ori/.
Rosenberg, Noah A. 2011. A population-genetic perspective on the similarities and differences among worldwide human populations. *Human Biology* 83(6): 659–684. Online at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3531797/.
Roth, Philip L., Craig A. Bevier, Philip Bobko, et al. 2001. Ethnic group differences in cognitive ability in employment and educational settings: A meta-analysis. *Personnel Psychology* 54(2): 297–330. Online at https://onlinelibrary.wiley.com/doi/10.1111/j.1744-6570.2001.tb00094.x.
Roughgarden, Joan. 2013. *Evolution's Rainbow: Diversity, Gender, and Sexuality in Nature and People*. Oakland, CA: University of California Press.
Royal Society Te Apārangi. 2021. Marsden Fund awards 2021. Online at https://www.royalsociety.org.nz/what-we-do/funds-and-opportunities/marsden/awarded-grants/marsden-fund-awards-2021/.
Sax, Leonard. 2002. How common is intersex? A response to Anne Fausto-Sterling. *The Journal of Sex Research* 39(3): 174–8. Online at https://pubmed.ncbi.nlm.nih.gov/12476264/.
Schnettler, S. 2020. The sociobiology wars. In T. Shackelford and V. Weekes-Shackelford (eds). *Encyclopedia of Evolutionary Psychological Science*. Cham, Switzerland: Springer, Cham.
Schoenhaus, Samantha A., Scott E. Lentz, Peter Saber, et al. 2008. Pregnancy in a hermaphrodite with a male-predominant mosaic karyotype. *Fertility and Sterility* 90(5): 2016.e7–2016.e10. Online at https://www.sciencedirect.com/science/article/pii/S0015028208002331?via%3Dihub.
Science must respect the dignity and rights of all humans. 2022. *Nature Human Behaviour* 6: 1029–1031. Online at https://www.nature.com/articles/s41562-022-01443-2.
Sherva, Richard, Rui Zhang, Nathan Sahelijo, et al. 2023. African ancestry GWAS of dementia in a large military cohort identifies significant risk loci. *Molecular Psychiatry* 28: 1293–1302. Online at https://www.nature.com/articles/s41380-022-01890-3.
Society for the Study of Evolution. 2018. Policy: Letter RE: Scientific Understanding of Sex and Gender (October 30). Online at https://www.evolutionsociety.org/news/display/2018/10/30/letter-re-scientific-understanding-of-sex-and-gender/.
Somerville, Ewan. 2021. Imperial College told to remove bust of slavery abolitionist because he 'might now be called racist.' *The Telegraph* (October 26). Online at https://www.telegraph.co.uk/news/2021/10/26/imperial-college-told-remove-bust-slavery-abolitionist-might/.
Tang, Hua, Tom Quertermous, Beatriz Rodriguez, et al. 2005. Genetic structure, self-identified race/ethnicity, and confounding in case-control association studies. *American Journal of Human Genetics* 76(2): 268–275. Online at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1196372/.
Turkheimer, Eric. 2000. Three laws of behavior genetics and what they mean. *Current Directions in Psychological Science* 9(5): 160–164. Online at https://journals.sagepub.com/doi/abs/10.1111/1467-8721.00084.
Uffelmann, Emil, Qin Qin Huang, Nchangwi Syntia Munung, et al. 2021. Genome-wide association studies. *Nature Reviews Methods Primers* 1: 1–21. Online at https://www.nature.com/articles/s43586-021-00056-9.
Wawira Gichoya, Judy, Imon Banerjee, Ananth Reddy Bhimireddy, et al. 2022. AI recognition of patient race in medical imaging: a modelling study. *The Lancet* 4(6): e406–e414. Online at https://www.thelancet.com/journals/landig/article/PIIS2589-7500(22)00063-2/fulltext.
Weinberg, Richard A., Sandra Scarr, and Irwin D. Waldman. 1992. The Minnesota transracial adoption study: A follow-up of IQ test performance at adolescence. *Intelligence* 16(1): 117–135. Online at https://www.sciencedirect.com/science/article/abs/pii/016028969290028P.
Winegard, Bo. 2020. I've been fired. If you value academic freedom, that should worry you. *Quillette* (March 6). Online at https://quillette.com/2020/03/06/ive-been-fired-if-you-value-academic-freedom-that-should-worry-you/.
Winegard, Bo, Ben Winegard, and Jonathan Anomaly. 2020. Dodging Darwin: Race, evolution, and the hereditarian hypothesis. Personality and Individual Differences 160(July): 109915. Online at https://www.sciencedirect.com/science/article/pii/S0191886920301045#bib0081.
Wright, Colin. 2018. The new evolution deniers. *Quillette* (November 30). Online at https://quillette.com/2018/11/30/the-new-evolution-deniers/.
Yellowstone Volcano Observatory. 2020. How a thermophilic bacterium from a Yellowstone hot spring is helping the fight against the COVID-19 pandemic. USGS (March 30). Online at https://www.usgs.gov/observatories/yvo/news/how-thermophilic-bacterium-yellowstone-hot-spring-helping-fight-against.

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A few lines after stating the Mpemba effect, Aristotle offers it as the explanation for rainstorms in hot climates often being torrential: "For the same reason in Arabia and Aethiopia rain falls in the summer and not in the winter, and falls with violence and many times on the day: for the clouds are cooled quickly by the reaction due to the great heat of the country" (Aristotle 1952). It is a wrong explanation for a real phenomenon. Source: Jessie Eastland, Wikimedia Commons.

The Rise and Fall of the Mpemba Effect

Hot fluids freeze faster than cold fluids. This was what high school student Erasto Mpemba reportedly discovered. However, his discovery turned out to be a misunderstanding—one with a long history.

MARTIN BIER

Thirteen-year-old Erasto Mpemba was in high school when he observed that a mixture of milk and sugar froze faster if placed in a freezer while it was hot. This happened in 1963 in what is now Tanzania.

When Mpemba followed up on what he had found, his physics teachers told him it was nonsense. Local street ice cream vendors, on the other hand, turned out to be very familiar with what Mpemba had observed.

A few years after Mpemba's discovery, prominent British physics professor and diplomat Denis Osborne visited Mpemba's school for a guest presentation. During the Q&A session after the presentation, young Mpemba again brought up his discovery, and again he was derided by his teachers and fellow students.

But the distinguished diplomat had become intrigued, and he carried out experiments—not with ice cream but with water—after his return to Dar es Salam. Eventually, in 1969, this led to the publication of an article in the journal *Physics Education* (Mpemba and Osborne 1969). Mpemba had finally been proven right! The article, authored by Mpemba and Osborne, is very readable and has become a classic.

That hot water freezes faster than cold water is today known as the Mpemba Effect. However, the idea has a history that goes back much further than the 1960s. In the fourth century BCE, Aristotle wrote in his treatise on meteorology: If the water has been previously heated, this contributes to the rapidity with which it freezes: for it cools more quickly (Aristotle 1952). At the beginning of

the seventeenth century, Francis Bacon was among the first to articulate how scientific knowledge and insight can be obtained through a combination of observation and reason. In his *Novum Organum*, he wrote, "*aqua parum tepida facilius conglacietur quam omnino frigida* ("water a little warmed is more easily frozen than that which is quite cold"; Bacon 1902). The *Physics Education* article by Mpemba and Osborne refers to none of this history.

The article by Mpemba and Osborne describes in detail how the young, innocent Mpemba was misunderstood and scoffed at when recounting his discovery. None of his teachers took him seriously. Naturally, this engages the reader's sympathy for Mpemba. The picture painted is of an enthusiastic and incorruptible youngster colliding with a narrow-minded establishment. The story evokes the struggles of Galileo and Albert Einstein, ground-breaking scientists up against a ruling order that is persisting in dogma. Osborne's experiments and the article reporting the outcomes of these experiments are a heart-warming happy end fit for a Hollywood movie—one that puts the Cinderella story in a twentieth-century academic context.

Mpemba and Basic Principles

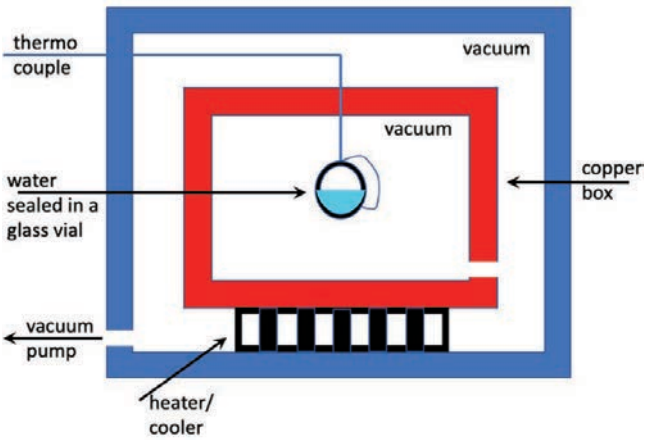
On a number of counts the article by Mpemba and Osborne gets it wrong. The derision Mpemba experienced was based on sound scientific intuition. The Mpemba Effect is an assault on the insight and understanding that one acquires over many years of studying physics.

In the nineteenth century, physicists came to the realization that heat is a form of energy. As a gallon of water cools down from the boiling point (100°C) to the freezing point (0°C), energy is released. This process is reversible, i.e., the same amount of energy must be added again when the water is returned from the freezing point to the boiling point. If the Mpemba Effect were real, it would mean that more energy is required to bring the water from the freezing point to 80°C than to 100°C. This is not consistent with the fact that a cup of water reaches a higher temperature if it is heated up in the microwave oven for a longer time.

The Mpemba Effect violates the First Law of Thermodynamics, which says that energy can neither be created nor destroyed; it can only be transferred from one form to another. The First Law of Thermodynamics is probably the most corroborated of all laws in physics and can be considered a universal principle. In breaching this law, the Mpemba Effect implies the possibility of constructing a perpetuum mobile (i.e., a car that does not require fuel).

But there's more: Assume we have two glasses of water at room temperature. The first glass has been at room temperature for a long time. The second glass has just been cooled down from a higher temperature. We put both glasses in a freezer. According to Aristotle, Bacon, and Mpemba, the second glass would freeze faster than the first glass, implying that the glasses of water somehow "remember" what happened in the past (i.e., whether or not they had been previously heated). This goes against everything we know about thermodynamics! In liquid water at room temperature, each molecule moves with a speed of about a quarter of a mile per second and collides on average around a trillion times per second with another molecule. This is known as Brownian motion. Temperature is merely a number that indicates the average energy of the Brownian motion of the molecules. Brownian motion makes it impossible for the molecules in a glass of water to maintain a structure; there is no mechanism to preserve a "memory."

Mpemba's story of different freezing speeds clashes with principles of elementary thermodynamics. In 1963, as now, physics teachers had a professional duty to say so and explain why. That the Mpemba Effect kept being a subject of wonder and debate for decades is mostly a result of physicists conceiving inept interpretations of poorly designed experiments.

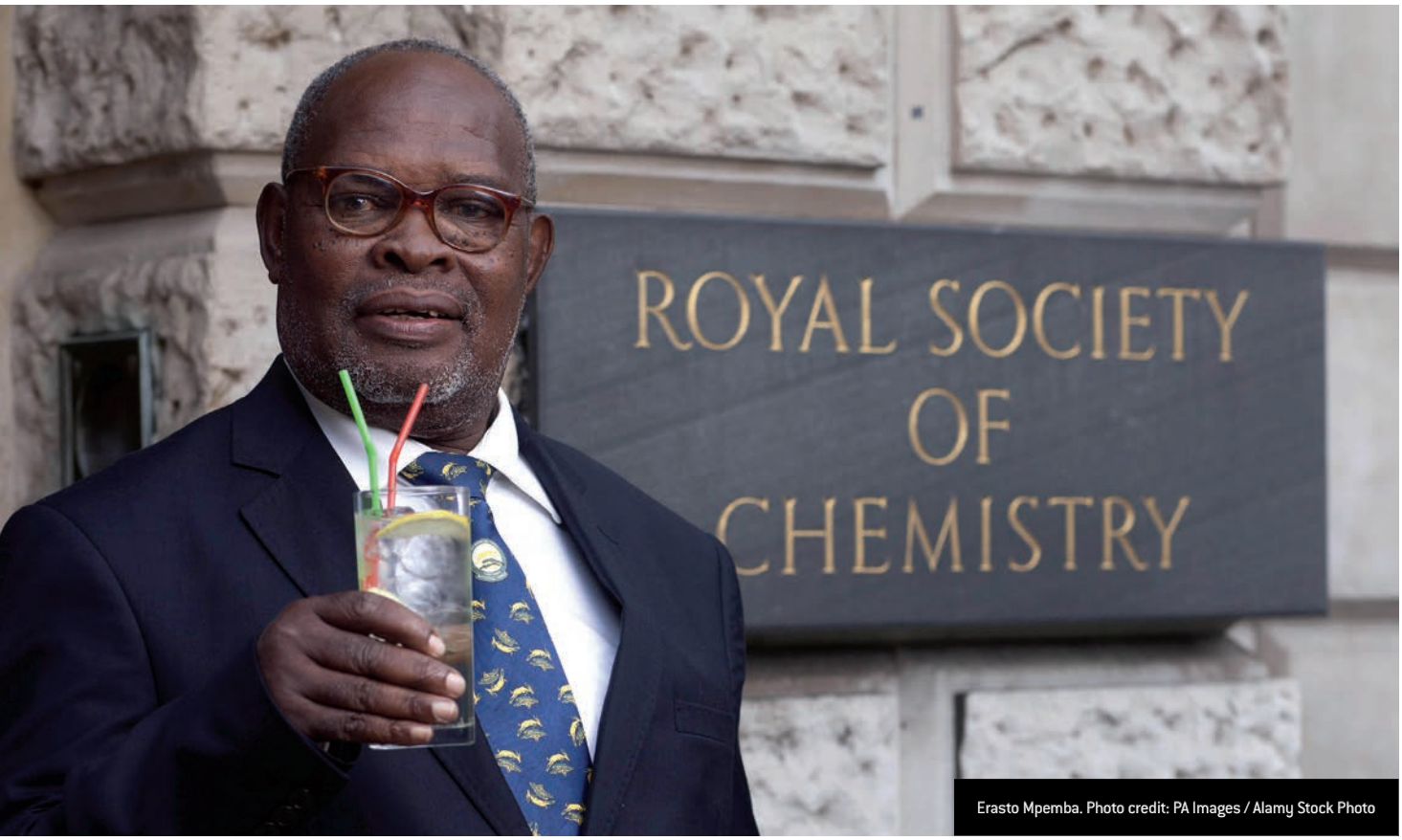


The setup that James Brownridge used to investigate the Mpemba Effect. By eliminating variables that are possibly beyond the control of the experimenter, Brownridge attempted to come to solid, reproducible results. Drawn by the author based on Figure 2 of the reference by Brownridge.

Brownridge's Experiment

In 2011, James Brownridge of the State University of New York in Binghamton published an article in the prestigious *American Journal of Physics* (Brownridge 2011). Brownridge's experiments were meticulous and well-described. The work was decisive.

Heat moves from hot to cold objects. There are three ways in which heat can be moved: (1) *Conduction* takes place inside solid material where molecules have fixed positions; it is the way a teaspoon in a hot cup of tea gets hot. (2) *Convection* occurs when a gas or liquid circulates between a hot and a cold object and transfers heat; it is what happens in a convection oven. (3) *Thermal radiation* is electromagnetic radiation that is emitted by every object. The higher the temperature of an object, the more radiation it emits. Sunlight, for instance, is thermal radiation that we receive from the Sun.



Erasto Mpemba. Photo credit: PA Images / Alamy Stock Photo

To properly test the Mpemba Effect in an experiment, all three forms of heat transfer need to be controlled as much as possible.

The schematic on p. 49 shows Brownridge's experimental setup. Distilled water is contained in a vial that is melted shut and hung from a wire in a vacuum. The vacuum has been created in a copper box. Copper is a good heat conductor, and this guarantees that the temperature around the vial is the same everywhere. The vial's temperature is measured continuously and accurately with an electronic device called a thermocouple. Note that thermal radiation is the only way the vial exchanges heat with the copper box. Conduction and convection have been ruled out because of the vacuum. Heat transfer through the wire is negligible.

However, even with Brownridge's setup, not everything is under control. Freezing always starts at a nucleation site and propagates from there. The nucleation site is generally a small dust-size particle. For tap water or water in a pond, the nucleation sites are generally the abundant dirt particles or other impurities. Freezing then readily occurs at the proper 0°C. But the pure, distilled water in Brownridge's experiments may stay liquid until well below 0°C. This is called "supercooling." It is actually possible to keep pure water liquid until -45°C. The distilled water in Brownridge's experiments tended to freeze at temperatures between -20°C and 0°C. The freezing temperature varied from one vial to the next but was always the same for one particular vial. This is likely because the nucleation sites in Brownridge's vials were small irregularities in the glass walls.

Brownridge found that for vials with the same shape and size, 0°C is always reached first in the vial that started with the lower temperature. It is in principle possible that the vial with the warmer water will freeze before the vial with the colder water. This can happen when the vial with the warmer water contains a microscopic irregularity in the glass wall that gives rise to a higher freezing temperature. That wall irregularities are responsible is evidenced by the fact that for one and the same vial, the freezing always occurs at the same temperature.

Details and Reproducibility

In a scientific experiment, it is important to consider all variables and their possible effects on the outcome of the experiment. Spontaneous generation—another idea that goes back to Aristotle—provides a good example of this. Until the late seventeenth century, it was believed that flies originate from cadaver tissue, that shells spontaneously form from sand, and that mice appear out of nothing in grain. Simple experiments in which cadavers, sand, and grain were isolated and observed demonstrate that these beliefs were wrong.

The fact that the Tanzanian ice cream vendors confirmed Mpemba's observations is not surprising. The vendors would probably have used freezers without a dehumidifier.

In the course of a day, a freezer is opened and shut many times, each time allowing an amount of hot, humid air in. Because cold air can contain less humidity than warm air, surplus humidity settles in the form of ice crystals inside the freezer and forms a layer of frost. Air is a good thermal insulator, and if a cup of water is put inside a freezer, most cooling will occur through the bottom of the freezer that the cup is standing on. However, if the cup is standing on a layer of frost, the cooling will be slower. This is because the frost is porous and contains a lot of air. The layer of frost effectively acts like a wool sweater between the cup and the cold surface. But now imagine that a hot cup of water is put on a thin layer of frost. It is then possible that the layer of frost is melted away and that the cup will ultimately make full contact with the bottom of the freezer. The subsequent cooling will then be faster, and it is possible that a cup that started at a colder temperature will be caught up with and overtaken on the race to freezing.

The claim that warm water freezes faster than cold water is too general to be considered scientific. Lake Michigan will not freeze over during one freezing night while a small container with hot water placed on the edge of Lake Michigan will readily freeze from top to bottom. So, scale is a factor. The material of the contact surface also plays a role. Water in a metal container will freeze faster than water in a wooden container of the same size and shape. This is because metal is a better heat conductor than wood. The shape of the container is also significant. Because of the larger contact surface, water on a flat tray will freeze faster than the same amount of water in a spherical container.

Scientific articles that give experimental results generally have a Materials and Methods section in which detailed descriptions are given of procedures and the equipment used. A good Materials and Methods section guarantees the reproducibility of the reported results. The one-liners of Aristotle and Francis Bacon are such that there is no way to ever find out again how the underlying observation of the Mpemba Effect came about. Aristotle implies it is common knowledge as he follows up the statement of the alleged effect with: "Therefore many people when they want to cool water quickly first put it in the sun" (Aristotle 1952). Bacon's assertion of the Mpemba Effect is a side remark amid an abstruse pharmacological account (Bacon 1902).

In the first few decades after the 1969 article by Mpemba and Osborne, much experimental work was done on the Mpemba Effect. Sometimes the effect was observed and sometimes it was not. Different researchers used different setups and only rarely did someone try to exactly reproduce the results of someone else. The large number of variables involved in the freezing of water, the lack of appropriate detail in the reporting, and the lack of a proper emphasis on reproducibility ultimately led to the Mpemba Effect myth lasting much longer than it should have.

The way in which the Mpemba Effect is written about has changed in the decade following the publication of the Brownridge article. Articles in which exotic mechanisms are postulated to explain the Mpemba Effect no longer abound.

In 2012, the British Royal Society of Chemistry organized a contest with a thousand English pounds in prize money for the best explanation of the Mpemba Effect. There were 22,000 entries, and Erasto Mpemba himself was there for the award ceremony. Nikola Bregović of the University of Zagreb prevailed. In the winning article, he described his own experiments and confined the analysis to elementary thermodynamics (Bregović 2012). He pointed to four factors as being of possible significance: evaporation, dissolved gases, convection, and supercooling. Bregović argued how supercooling is ultimately the significant factor and, in the conclusion, he quoted Brownridge's article: "Hot water will freeze before cooler water only when the cooler water supercools, and then, only if the nucleation temperature of the cooler water is several degrees lower than that of the hot water. Heating water may lower, raise or not change the spontaneous freezing temperature" (Bregović 2012).

In 2016, a long article by Henry Burridge and Paul Linden of Cambridge University appeared in *Nature: Scientific Reports* (Burridge and Linden 2016). The article gives a thorough overview of the confusion and the lack of reproduction of results that have characterized the discussion on the subject since 1969. The authors conducted their own experiments, and they excluded supercooling as a factor by just measuring how long it takes for water to cool down to 0°C. The Mpemba Effect then no longer occurs. The article's title sums it up well: "Questioning the Mpemba Effect: Hot Water Does Not Cool More Quickly Than Cold." ■

Note

In June 2022, a Dutch-language version of this article appeared on the blog kloptdatwel.nl at https://kloptdatwel.nl/2022/06/07/de-opkomst-en-ondergang-van-het-mpemba-effect/.

References

Aristotle. 1952. *Meteorologica.* Translated by H.D.P. Lee. Loeb Classical Library 397. Cambridge, MA: Harvard University Press. Book 1, Chapter 12. Free translation also online at http://classics.mit.edu/Aristotle/meteorology.1.i.html.

Bacon, F. 1902. *Novum Organum*. Translated by J. Devey. New York: P.F. Collier & Son. Book 2, Chapter 50, Section 4, p. 277. Also online at https://www.thelatinlibrary.com/bacon/bacon.liber2.shtml.

Bregović, N. 2012. Mpemba effect from a viewpoint of an experimental physical chemist. Online at https://www.rsc.org/images/nikola-bregovic-entry_tcm18-225169.pdf.

Brownridge, J.D. 2011. When does hot water freeze faster than cold water? A search for the Mpemba effect. *American Journal of Physics* 79: 78–84.

Burridge, H.C., and P.F. Linden. 2016. Questioning the Mpemba effect: Hot water does not cool more quickly than cold. *Scientific Reports* 6: 37665.

Mpemba, E.B., and D.G. Osborne. 1969. Cool? *Physics Education* 4: 172–75.

Martin Bier is a professor of physics at East Carolina University. At the age of twelve, he devised a way to fly on his bicycle. But not much later he figured out that the design involved violations of basic laws of physics. Later again, he obtained advanced degrees in physics and mathematics from the University of Amsterdam and Clarkson University.

On the Origin of the Post-it Note: Intelligently Designed?

Necessity isn't always the mother of invention. The Post-it note was never designed to solve a problem; rather, it was a solution needing a problem. The remarkable origin of the Post-it underscores the causal confluence of context, coincidence, and consequence in the evolution of creative behaviors and innovations.

EDWARD A. WASSERMAN

"Who knows more about making things stick than 3M?" At first blush, this catchy slogan seems especially ironic when applied to one of 3M Company's most popular products, the Post-it note (Wilkof 2010). Unlike Scotch Tape—the firm's other cherished adhesive product that firmly and permanently holds papers together—the Post-it note appears to have been brilliantly designed to permit its grip to be weak and temporary. However, appearances can be deceiving.

The true origin of the Post-it note debunks the myth of intelligent design. Its evolution agrees with other evidence I've gathered from a wide realm of endeavors including science, medicine, sports, politics, culture, and the arts (Wasserman 2021)—all of it instead pointing to context, coincidence, and consequence as more objective and effective determinants of creative innovations. I'll explain my behavior analytic framework later, but now to the Post-it story.

The passing of Spencer Silver in 2021, along with the 2020 posting of possibly Silver's last recorded conversation with 3M collaborator Art Fry, prompted me to take a critical look into the duo's famed creation: the Post-it note. In doing so, I hope to shed fresh light on the origin of their specific product as well as more generally on the process of innovation.

Origin tales can be recounted in many different ways. That's one of the main reasons history can be such a vexing field, even when outlining the development of products as familiar and fêted as the Post-it note (Beato 2005; Berkun 2017; Flavell-While et al. 2018; Hiskey 2011; Petroski 1992).

Consider a few interpretive alternatives. According to one account, the Post-it note didn't spring from foresighted or intelligent design but from an entirely serendipitous discovery—a weak adhesive resulting from an extemporaneous chemistry experiment. The Post-it note also contradicted the maxim that necessity is the mother of invention: What

pressing need could there have been for an anemic adhesive? A third version invokes the alluring and enduring notion of insight—that moment when an ingenious idea unexpectedly and inexplicably comes to mind.

All three of these storylines have sought to explain the origin of the Post-it note, even by Silver and Fry themselves. Let's see how they fare, beginning with serendipity.

Serendipity

Spencer Silver took particular note of the fact that, in 1754, English writer and politician "Horace Walpole coined the word 'serendipity.' It came from a tale about three princes from Serendip, Sri Lanka. They were always discovering things they weren't in search of. [For Silver, however, the key was that:] You must recognize it as a discovery" (3M Company 2002, 50). Indeed, because of his own serendipitous discovery just two years into his thirty-year tenure as a corporate scientist at 3M, Silver was to enter the pantheon of famous inventors.

Encouraged by his supervisor to experimentally explore pressure-sensitive adhesives, in 1968, the newcomer chemist felt free to deviate from industry convention. The stupefying result of one of his impromptu inquiries was not a super-strong adhesive—his actual quest—but a super-weak one! Years later, Silver drolly noted: "It was part of my job as a researcher to develop new adhesives, and we wanted to develop bigger, stronger, tougher adhesives. This was none of those" (3M Company 2021).

Nevertheless, Silver didn't deem this unforeseen result to signify a serious misstep. Instead, he viewed it more philosophically: "I've never believed you make mistakes in the laboratory. It's just that you just don't understand the results of the chemistry you just did" (National Inventors Hall of Fame 2020). Nor did Silver regard this accidental adhesive to represent a useless failure. Rather, he accepted the surprising discovery as one of great interest and potential. As a self-proclaimed "molecular architect," Silver may be said to have struck gold, but did it have any practical or commercial value?

Necessity

Aye, there's the rub. Even granting the unique adhesive attributes of Silver's curious concoction, it surely wasn't needed to solve a pressing problem. Quite the contrary; "My discovery was a solution waiting for a problem to solve" (3M Company 2002, 38).

Faced with this uncommon conundrum, Silver proceeded to earn his nickname at 3M as "Mr. Persistent" as he tenaciously searched to find the way to a successful and marketable product: "I spun my wheels a long time trying to find a product I could put my adhesive on. There were a bunch of them, but none of them were really that big and big enough to pursue other than in a trivial way" (National Inventors Hall of Fame 2020).

One rather unremarkable product did derive from Silver's discovery: "Using the adhesive, the company developed a bulletin board that remained permanently tacky so that notes could be stuck and removed" (Duguid 2010). Various versions of that sticky bulletin board are still sold by 3M. Nevertheless, Silver remained frustrated by the bulletin board's limited appeal and therefore continued his pursuit of a profitable application. "I felt my adhesive was so obviously unique that I began to give seminars throughout 3M in the hope I would spark an idea among its product developers" (Duguid 2010).

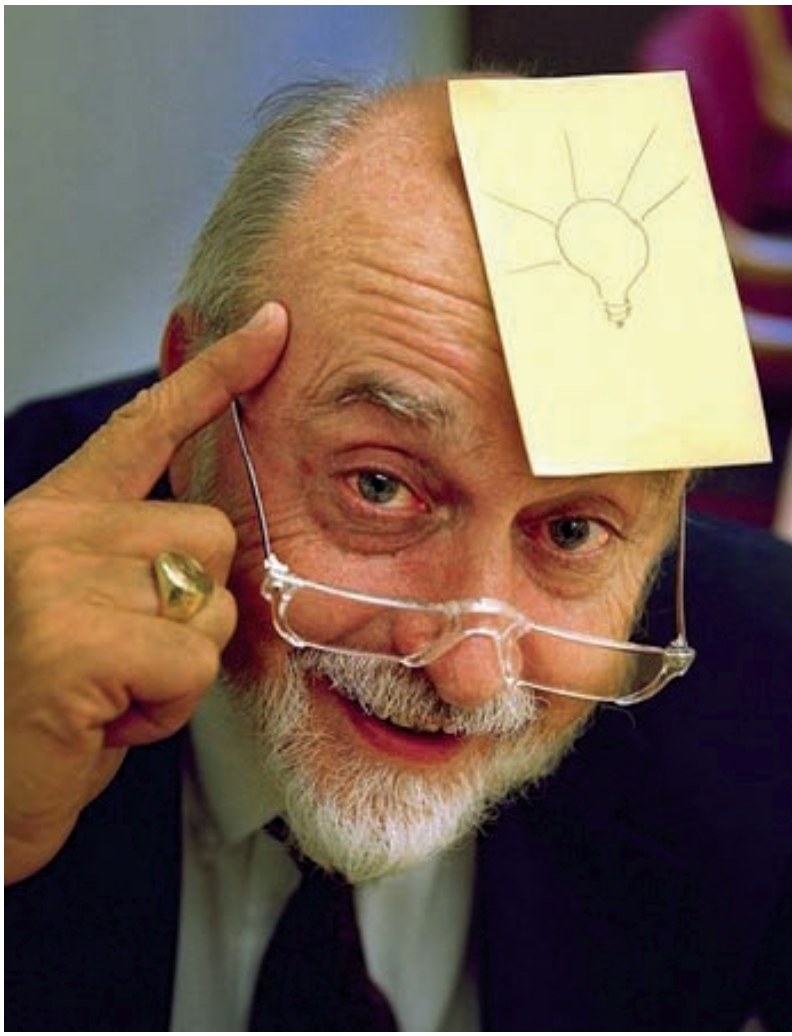


Figure 1. Art Fry and his Post-it note sporting an illuminated bulb. Photo credit: Lemelson Center/Photo courtesy of Art Fry.

One seminar attendee who wanted to learn more about the peculiar properties of Silver's adhesive was Art Fry, who recounts: "I worked in the Tape Division Lab, where my job was to identify new products and build those ideas into businesses. I listened to the seminar and filed it away in my head" (Duguid 2010). After all, Fry assiduously adhered to a long-standing corporate dictum: "At 3M we're a bunch of ideas. We never throw an idea away because you never know when someone else may need it" (3M Company 2002, 38). In this instance, Fry himself was to profit from this stored memory.

Insight

Fry famously envisioned a use for the adhesive one Sunday in 1974. He was singing in his St. Paul, Minnesota, church

choir when he encountered a problem with his hymn book. The prior Wednesday, Fry had inserted a small scrap of paper into the hymnal to mark the canticle he would be singing. But his meticulous plan went woefully awry:

> I found that the little piece of paper I used to mark the music had fallen out, making me fumble about trying to find the right page. This was followed by a dull sermon. My mind was wandering back to the music problem when I had one of those "flashes of insight." Eureka! By using [Silver's] recently invented adhesive, I could make a bookmark that could be stuck on, and removed, without damaging the book. (Lemelson Center 2014)

The following Monday morning, Fry secured a sample of the adhesive from Silver and crafted a makeshift bookmark. When Fry tried it out at the next choir practice, he found that the bookmark did successfully stick to the page. Furthermore, it was readily removable.

Some authors who tell the tale of the Post-it note stop right there, proclaiming that this *hallelujah* experience marks the end of story. But that's far from the case; although Fry's sticky bookmark stayed in place and was safely detached, some of the adhesive remained on the page when he peeled away the bookmark. Only after conducting several subsequent experiments with reformulated adhesives did Fry succeed in producing a bookmark that didn't leave behind any tacky residue.

Fry then unofficially test marketed this new and improved bookmark with fellow 3M employees. The sticky bookmarks were very popular. But because they could be used repeatedly, people weren't clamoring for more. It didn't take a marketing master like Fry to appreciate that a reusable bookmark wasn't going to be a best-selling product. Fry's hunt for a high-demand product therefore continued.

"Then one day, I was writing a report and I cut out a bit of bookmark, wrote a question on it and stuck it on the front. My supervisor wrote his answer on the same paper, stuck it back on the front, and returned it to me. It was a eureka, head-flapping moment—I can still feel the excitement. I had my product: a sticky note" (Duguid 2010). From this exhilarating experience, Fry concluded, "What we have here isn't just a bookmark. It's a whole new way to communicate" (3M Company 2021).

So, did Fry's second eureka moment at last seal the deal? Absolutely not! As Fry learned from his own extensive history of successes and failures: "The idea is the easiest part. Ideas occur in a flash in your mind. Some people think all you need is the idea. Well, ideas are a dime a dozen, really. The ability to turn that idea into a finished business is what requires all the work" (Lemelson Center 2008).

Fry's subsequent work was extensive and time consuming. Beyond the challenges of perfecting the chemistry, building the manufacturing equipment, and devising the means of packaging the fledgling product, Fry had to convince his superiors that the sticky note would eventually be profitable. Alas, the company's own formal market research suggested that only $750,000 in total business could be expected from its production. Fry disagreed and sought to prove his point by offering sample note pads to fellow 3M employees. "The results were dramatic. We had executives walking through knee-deep snow to get a replacement pad. It was going to be bigger than Magic Tape, my division's biggest seller" (Lemelson Center 2008).

These promising initial reactions notwithstanding, major corporations such as 3M didn't become big and successful because they were nonchalant about embarking on risky ventures. The marketing department demanded even more proof that the sticky note could turn a major profit. So in 1977, 3M field tested the notes in four cities—Richmond, Virginia; Denver, Colorado; Tampa, Florida; and Tulsa, Oklahoma—under the name Press 'n Peel. Although the alliterative moniker accurately described how to apply and remove the product, the name didn't suggest how to use it. For this and other reasons, the field test proved disappointing.

The next year, 3M again tried to assess the market potential of the sticky sheets—now rebranded Post-it notes. Fry recalled that, for this test: "We realized we needed samples. People had to see how useful they were. Our first samples were given out in Boise, Idaho and feedback was 95 per cent intent to re-purchase" (Duguid 2010). The so-called "Boise Blitz" of free samples and tutorials by 3M representatives finally did the trick and convinced the company to officially launch the product in 1980. The rest is 3M history.

Perspective

I've tried in a few hundred words to provide an in-depth portrayal of Spencer Silver's and Art Fry's twelve-year development of the Post-it note, making particular use of their colorful first-hand commentaries. Now, imagine how many words you would use to describe the process of innovation if you only saw a single photograph of Art Fry with a Post-it note displaying a lighted bulb stuck to his forehead (Figure 1). You might say something like: "*Voilà*! The idea of the Post-it note suddenly and miraculously occurred to Fry."

This narrative might be more concise. But, how jejune it would be—utterly simplistic, shallow, and inaccurate! Fry obviously staged this cheerful photograph to convey his delight in creating the Post-it note. But miracles don't empower inventors to create new ideas and products. Rather, as Fry explained, "For inventiveness, it requires taking things you already know about, but that aren't normally put together, and you put them together in different patterns" (National Inventors Hall of Fame 2020). Most of those patterns turn out to be worthless "dime-a-dozen" ideas; only a precious few yield big payoffs. It might even be said: Some ideas stick—others don't!

Fry was not alone in appreciating the sheer improbability of generating good ideas or creating useful inventions; as Thomas Edison famously remarked, "To have a great idea, have a lot of them."

Of course, Edison's "brightest" idea—the one drawn on Fry's Post-it note—was the incandescent lightbulb. But Edison didn't have the original idea of the lightbulb; he did dramatically increase its durability and reduce its price, thereby making it readily available for illuminating both public and private spaces (Franklin Institute n.d.). But that significant

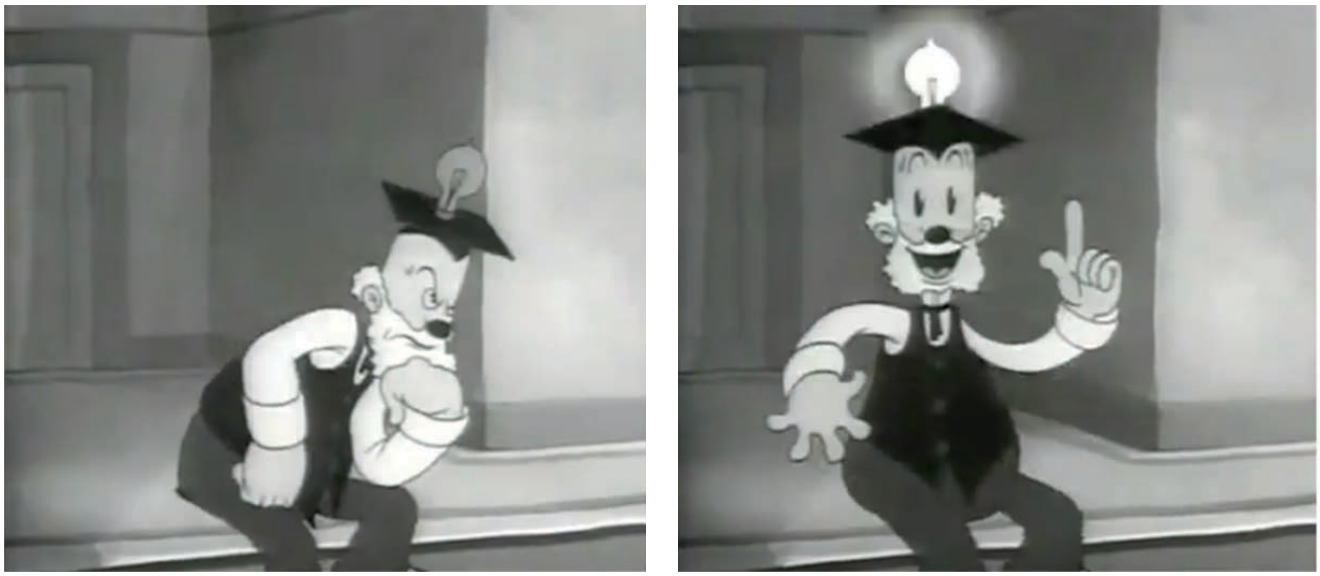


Figure 2. Professor Grampy has a "lightbulb moment." (Still images from *Grampy's Indoor Outing* (1936)/Max Fleischer Studios.)

contribution certainly didn't result from a "lightbulb moment." To develop the filament that made the lightbulb practical, Edison claimed to have arduously tried many alternative materials: "Before I got through I tested no fewer than 6,000 vegetable growths, and ransacked the world for the most suitable filament material." This, and other examples of Edison's dogged determination, validate another of his famous quotations, "Genius is one percent inspiration and ninety-nine percent perspiration."

If the "lightbulb moment" isn't to be credited to Edison, then how did this widespread cliché originate? Some authors suggest that the expressive symbols and images that often appeared above the head of silent cartoon favorite Felix the Cat hold the key. However, a different cartoon character—Professor Grampy—seems to have been the true source (Keaggy 2019; Mankoff 2014). In ten animated shorts produced from 1935 to 1937 by Max Fleischer Studios, the spry gadgeteer frequently helped Jazz Age flapper Betty Boop solve a series of practical problems. Before doing so, Grampy would don his thinking cap—a mortarboard with an unlit lightbulb on top. As soon as he hit upon a solution, the bulb would light up, and Grampy would proudly exclaim, "I've got it!" Despite this vivid evidence (Figure 2), the story behind the animation of Grampy's lightbulb is still untold.

A Fresh Look at Innovation

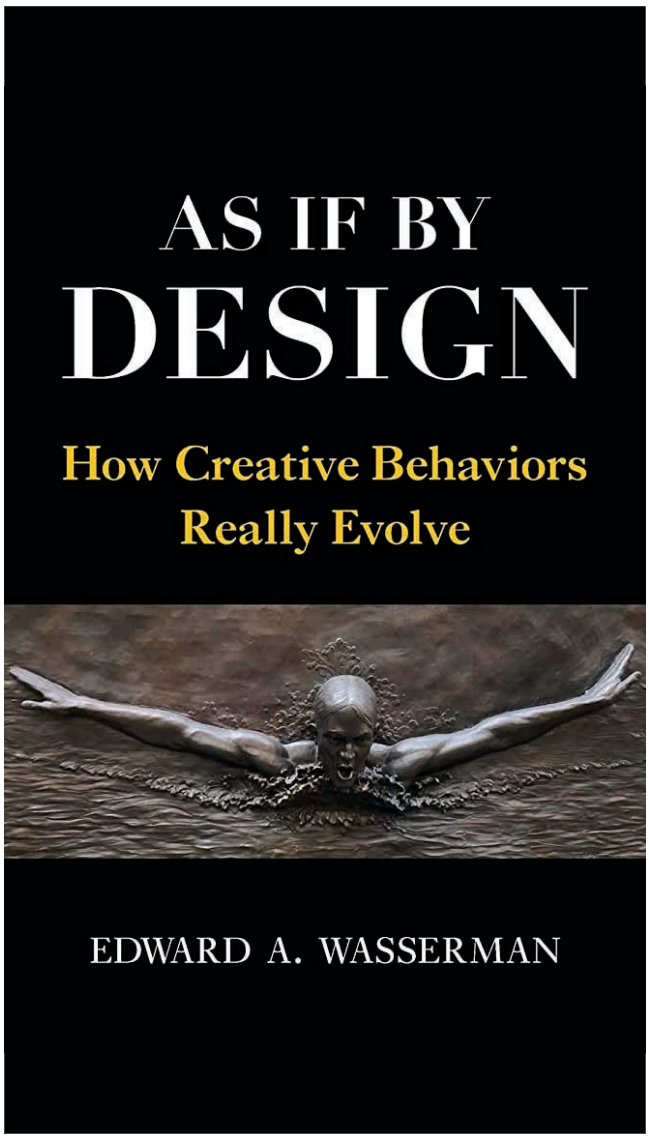
Innovations are often said to be overdetermined; even single effects can be the result of multiple causes. It should now be clear that the Post-it note was created by a confluence of many contributing factors. No solitary event prompted this celebrated invention, and neither did intelligent design anticipate its final form.

In my 2021 book, *As If by Design*, I've attempted to explain more generally how creative products and behaviors really evolve. I've done so by stressing the concerted contributions of three factors: context, coincidence, and consequence. All three plainly participated in the case of the Post-it note. Consider these highlights in its evolution.

Context. Everything happens at a particular time and in a particular place. I earlier mentioned the culture in which 3M employees were encouraged not to forget ideas that might prove useful to others in the company. That's why Fry filed away in memory what he had learned about Silver's strange adhesive. 3M further encouraged innovation by permitting its engineers and scientists to devote up to 15 percent of their time to pursue projects of their own choosing (corporately called "experimental doodling"; Govindarajan and Srinivas 2013). That policy allowed both Silver and Fry to continue their work on the adhesive and its potential applications for several seemingly unproductive years.

Coincidence. Of course, sheer chance may bring people and possibilities together. Good fortune is what comes from taking advantage of those possibilities. Fry's two "lightbulb moments" might better be treated as felicitous coincidences. The inventiveness of Fry's first eureka moment involved his putting together two things that created an unusual pattern: his recall of Silver's adhesive and his wayward hymnal bookmark. The inventiveness of Fry's second eureka moment was to appreciate that you could write efficient two-way messages on his initially blank bookmarks. Those bookmarks effectively reimagined 3M's previous Post-it bulletin board—messages now moving directly between people instead of being fixed in location and people having to travel back and forth to the bulletin board.

Consequence. Novel products and behaviors must yield positive results if they're ever to take hold. Silver's innovative adhesive initially produced no positive consequences. Only when Fry fabricated easily removable bookmarks and note pads did possibly profitable applications begin to take shape. Yet even those promising possibilities got off to rocky starts requiring further product development and consumer testing. In the end, and despite early pessimistic projections, fifteen billion Post-it notes are now purchased annually accounting



for $3.5 billion in sales. Now, that's proof of the pudding!

So, no, neither Spencer Silver nor Art Fry prophesied that the Post-it note could easily be pressed onto and peeled away from any number of different surfaces. The product's protracted and meandering evolution followed the path of most creative products and behaviors—a chiefly unscripted, trial-and-error process involving the intricate interplay of context, coincidence, and consequence. The Post-it note didn't evolve *by design*; it evolved *as if by design!*

In much the same impromptu manner that the Post-it note evolved, so too did the 3M Company. From a small mining enterprise in 1902, the originally named Minnesota Mining and Manufacturing Company[1] is now a Fortune 500 corporation manufacturing a wealth of products millions of people worldwide use daily. Yet that success story was never preordained, as the company itself acknowledges: "Our success and longevity were not apparent from the start. We tried. We failed. We tried something new. Repeat cycle. Innovation and perseverance drove our founders, and it continues to drive 3Mers today" (3M Company n.d.). ■

Note

1. *Fun fact:* Because the company's policy of improvisational exploration has so often proven profitable, some have whimsically suggested that 3M actually stands for Mistake = Magic = Money (Lukas 2003).

References

3M Company. n.d. 3M history: From humble beginnings to Fortune 500. Online at https://www.3m.com/3M/en_US/company-us/about-3m/history/.

———. 2002. A century of innovation: The 3M story. Online at https://multimedia.3m.com/mws/media/171240O/3m-century-of-innovation-book.pdf.

———. 2021. History timeline: Post-it® notes. Online at https://www.post-it.com/3M/en_US/post-it/contact-us/about-us/.

Beato, Greg. 2005. Twenty-five years of Post-it notes. *TheRake Magazine* (March 24). Online at https://rakemag.com/2005/03/twenty-five-years-post-it-notes-0/.

Berkun, Scott. 2017. How the Post-it note was invented. *Scott Berkun Blog* (February 16). Online at https://scottberkun.com/2017/how-the-post-it-note-was-invented/.

Duguid, Sarah. 2010. First person: 'We invented the Post-it Note.' *Financial Times* (December 3). Online at https://www.ft.com/content/f08e8a9a-fcd7-11df-ae2d-00144feab49a.

Flavell-While, Claudia, Spencer Silver, and Arthur Fry. 2018. In Search of an application. *The Chemical Engineer* (March 9). Online at www.thechemicalengineer.com/features/cewctw-spencer-silver-and-arthur-fry-in-search-of-an-application/.

Franklin Institute, The. n.d. Edison's lightbulb. Online at https://www.fi.edu/history-resources/edisons-lightbulb.

Govindarajan, Vijay, and S. Srinivas. 2013. The innovation mindset in action: 3M corporation. *Harvard Business Review* (August 6). Online at https://hbr.org/2013/08/the-innovation-mindset-in-acti-3.

Hiskey, Daven. 2011. Post-it notes were invented by accident. *Today I Found Out* (November 9). Online at http://www.todayifoundout.com/index.php/2011/11/post-it-notes-were-invented-by-accident/.

Jack, Albert. 2021. Post it notes—the accidental billion dollar invention. *Bangkok Jack* (April 25). Online at https://bangkokjack.com/2021/04/25/post-it-notes-the-accidental-billion-dollar-invention/.

Keaggy, Bill. 2019. Contending with clichés in visual communication: The "idea!" light bulb. *Tremendousness* (April 9). Online at https://tremendo.us/ness/contending-with-cliches-in-visual-communication-the-idea-light-bulb/.

Lemelson Center. 2008. Art Fry's invention has a way of sticking around (June 13). Online at https://invention.si.edu/podcast-art-frys-invention-has-way-sticking-around.

———. 2014. Art Fry: Post-it® note inventor (April 14). Online at https://invention.si.edu/art-fry-post-it-note-inventor.

Lukas, Paul. 2003. 3M: The magic of mistakes. *Fortune Small Business* (March 19). Online at https://www.mgt.ncu.edu.tw/~ckfarn/Mgt%20papers/3M.htm.

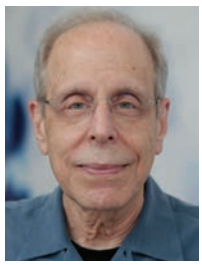
Mankoff, Robert. 2014. The "aha!" moment. *The New Yorker* (March 4). Online at https://www.newyorker.com/cartoons/bob-mankoff/the-aha-moment.

National Inventors Hall of Fame. 2020. Art Fry and Spencer Silver. YouTube (June 12). Online at https://www.youtube.com/watch?v=spMv8vtFlgo.

Petroski, Henry. 1992. Let us now praise the humble Post-it. *The Wilson Quarterly* 16(4): 104–110.

Wasserman, Edward A. 2021. *As If by Design: How Creative Behaviors Really Evolve.* Cambridge, UK: Cambridge University Press.

Wilkof, Neil. 2010. The wonderful IP story of the "Post-it" note. *The IPKat* (October 10). Online at https://ipkitten.blogspot.com/2010/10/wonderful-ip-story-of-post-it-note.html.



Edward A. Wasserman is a professor of psychological and brain sciences at the University of Iowa. He has published widely in the areas of learning, memory, and cognition in people and animals. His 2021 book, *As If by Design: How Creative Behaviors Really Evolve*, takes a fresh look at the origins of novel behaviors, ideas, and inventions and critiques the common myths of insight, foresight, and intelligent design.

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On Being Called a Debunker

WILLIAM M. LONDON

I suppose that if I had the investigative skills and extraordinary record of investigative accomplishments of Joe Nickell, I might—like Nickell—not want to be introduced by talk show hosts as a "well-known debunker" ("A Brief History of *Bunk*," SI, November/December 2022). *Debunker* doesn't signal to the audience how much care Nickell has taken over decades as a seeker of truth in collecting evidence, analyzing evidence, and drawing reasonable conclusions to solve various mysteries that purportedly require paranormal explanations. And *debunker* doesn't adequately convey how Nickell's writings and talks have helped others to reason well.

However, I'm not as concerned as Nickell that being introduced as a well-known debunker "can imply bias suggesting—rightly or wrongly—the results are known prior to investigation for certain topics." Being introduced as a debunker would not preclude a careful investigator from explaining one's unbiased, investigative methods.

In Nickell's distinguished record of investigation, he has never concluded that a paranormal explanation was likely. People who are so devoted to paranormal explanations that they would unfairly dismiss anyone's conclusions simply because they are introduced as a "well-known debunker" would likely also unreasonably dismiss the conclusions of anyone who has never endorsed paranormal explanations.

Even more neutral terms such as *skeptic* or *fact-checker* are taken by some people as indicative of being unfairly dismissive; let me share an example.

I know someone who has embraced a variety of conspiracy narratives about COVID-19. She doesn't have medical or public health expertise, but she likes others to know that she "does her own research." She knows me as a nice, dependable guy and a public health professor. She sends text messages to people with links to writings and videos from her favorite beyond-the-fringe, mostly ultra-right-wing websites. In 2021, she sent me links touting claims for hydroxychloroquine as an extraordinarily effective COVID-19 treatment. When I replied with links to relevant mainstream media fact-checking articles, she wrote back, "I don't believe fact checkers. They lie. I trust studies. Critical thinker here."

Unable to suppress my exasperation, I replied, "My writing is all about fact-checking and I am not a liar. I developed the 'Dubious COVID-19 Treatments and Preventives' page (https://centerforiquiry.org/coronavirus-cure-claims/), and one of the expandable sections is about hydroxychloroquine. You must consider all relevant studies and their quality. If you want to learn about assessing study design quality, you can take my epidemiology course."

The "critical thinker" replied, "I never said you were a liar. I don't trust fact checkers. They're liars."

I guess I was condescending and not appropriately empathetic in my reply. But I'm not sure how to have a productive conversation with someone who thinks that fact-checkers produce bunk.

Nickell notes in his commentary that *bunk* is short for *bun-*

kum, which means nonsense or empty talk and is a respelling of *buncombe*. The word originated from a story of political empty talk in Buncombe County, North Carolina. He notes that Wiktionary, like most standard dictionaries, regard *bunk* and *bunkum* as slang. He suggests that slang should not be used in serious writing. None of my dictionaries refer to those words or *bunk*, *debunk*, or *debunker* as slang. But I do agree with Nickell that simply calling something *bunk* is imprecise and inadequate.

Nickell finds using derivatives of *bunk* problematic. He mentions a story that was said to be debunked. He suggests that it would be better to say it was "examined and thoroughly disproved." But sometimes brevity is advantageous. And saying that a story was debunked or is bunk does not preclude providing relevant explanatory details.

Nickell also objects to the passive voice in saying that a story was debunked. But *debunked* can be used with active voice. Example: X debunked Y's claim.

Debunk is a common word in serious writings. I entered *debunk* as a search term in Google Scholar. It yielded 145,000 results. *Debunking* yielded 170,000 results, *debunked* yielded 84,200 results, and *debunker* yielded 11,600 results.

Prebunking is a term used in an active, emerging area of research. It refers to preemptive interventions used to combat misinformation, in contrast to *debunking*, a term used combating misinformation retroactively. My Google Scholar search for *prebunking* yielded 772 results.

Nickell writes that it's unfortunate that some skeptics refer to themselves as debunkers. But being branded as a debunker makes one stand out among the many "investigators" who draw sensational, farfetched conclusions regarding UFOs/UAP and supposedly haunted buildings. Building a reputation as a debunker, with or without trying to brand oneself a debunker, can get you media attention.

Nickell notes that the late James Randi (the most famous investigator of paranormal claims of the past half century) acknowledged being a debunker, by definition, but thought "*scientific investigator* covers it better." Nevertheless, Randi's obituary in *The New York Times* on October 21, 2020, was headlined "James Randi, Magician Who Debunked Paranormal Claims, Dies at 92."

William M. London is a professor of public health at Cal State LA and the editor of the free weekly email newsletter *Consumer Health Digest* published by the Center for Inquiry's Quackwatch. He writes a Consumer Health column at skepticalinquirer.org. He refers to himself as a consumer advocate.

***

Joe Nickell replies:

I appreciate William London's generous characterization of my continuing work, spanning over fifty years. Unfortunately, his second paragraph begins with that dreaded word *however*.

London tries to shore up the deficient, unclear word *bunk* and its derivatives: *Bunk* is wonderfully brief; you could tack on more details. It's better to be called a "debunker" than to be ignored. I can help with some more: It's already available; it rhymes with *junk*; and it's the root of *bunkered*.

Seriously, why not rid us of such a questionable word, substituting the praiseworthy, positive term *investigate*, and its derivatives: *investigation*, *investigative*, *investigator*? If one indeed investigates, any needed debunking should already be taken care of.

Thus, instead of saying, "The Shroud of Turin had been thoroughly debunked by skeptics and fact-checkers," you could state, for example: "Scientists have radiocarbon dated the Turin Shroud to ca. 1350, the time of a forger's confession." Or, again, "Scientific investigators have proved that the shroud image is made of red ocher and vermilion tempera paint."

Such an approach, I believe, would raise the quality of skeptical responses. ■

Skeptical Inquirer
THE MAGAZINE FOR SCIENCE AND REASON

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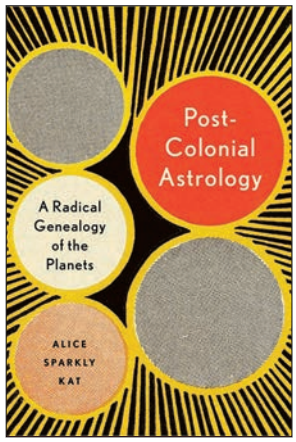
Double the Weirdness but Not Double the Fun

Taner Edis



Postcolonial Astrology: Reading the Planets through Capital, Power, and Labor. By Alice Sparkly Kat. Berkeley, CA: North Atlantic Books, 2021. ISBN 978-1-62317-530-6. x+323 pp. Paperback, $17.95.

I formed my first impression of *Postcolonial Astrology* while browsing in a bookstore. It seemed to be an aggressively stupid amalgamation of two normally separate species of nonsense. Flipping through it, I encountered the classic weirdness of astrology, where critical intelligence goes to die. Mixed in were hints of the sort of puritanical social justice ideology that dismisses science as a manifestation of white male colonialism.

There could, I thought, be something interesting for skeptics in the combination. Astrology has been largely invulnerable to scientific criticism; it occasionally slips out of fashion yet reliably resurfaces, promoting a vision of a universe working according to a maze of psychological metaphors. And then there are the many anti-scientific tendencies in the postmodern humanities. Elites in parts of the world subjected to Western colonialism have often been enthusiastic about modern technology—after all, colonized people have needed real *power* to beat back the bastards. But admiration of technology has often accompanied declarations that premodern cultures incorporate forms of knowledge superior to the narrow materialism of Western science. When such culturally conservative apologetics joins forces with the liberal guilt common in the academic humanities, the result is all sorts of praise for indigenous "ways of knowing" that trump modern science. If astrology were to join the mix, we might expect a variety of detachment from reality that should satisfy any connoisseur of weirdness.

Therefore, in anticipation of some good fun, I got a hold of *Postcolonial Astrology* through my campus library. It was not as entertaining as I had hoped. There is little in the book that actually argues for astrology; in fact, there is very little argument at all. It typically introduces a theme related to social justice or psychological trauma, transitions to an allusion to (or brief description of) the vaguely related views of a thought leader, spends a couple of paragraphs dancing around that, and jumps away again. The result is a disjointed series of free associations that do not argue for any particular conclusion but instead *evoke* a mood, an attitude, perhaps a sense of moral rectitude.

Curiously, on the book's own terms, this might be entirely appropriate. Alice Sparkly Kat's version of astrology is largely a set of cosmic metaphors that help adherents apprehend supposedly deep truths and achieve an accompanying sense of healing. And this sense of profound truth is attained through the kinds of associations helped along by the book. Kat's clients and customers seek this feeling of insight evoked by an immersion in associative linkages. Approaching such matters through criticism and demands for evidence is completely out of place according to this version of astrology. Deep truths emerge from guided associations and flashes of insight—not the dead hand of scientific analysis.

In a peculiar way, then, Kat has consistency on her side. My experience with *Postcolonial Astrology* at first reminded me of my reaction the time I read a book by Slavoj Žižek. I came out of that thinking that Žižek was an intellectual fraud. But I wonder, in this case, whether Kat has a genuinely intellectual purpose at all. If she really isn't aiming for truth but trying to evoke some vague self-contained sense of healing and justice, can I really fault her for ignoring science?

Kat and her clients are already convinced that astrology is deeply meaningful, and that conviction serves as its own proof. Kat's primary aim in *Postcolonial Astrology* is to reshape astrological associations to bring them more in line with current moral fashions among humanities-educated professionals who like to think of themselves as political progressives. The result often struck me as overly earnest—even ridiculous. For example, her section "Venus, the Highest and Lowest of all High Femmes Both Beautiful and Ugly" starts with, "Trigger warning: this section contains historical examples of hypersexualization" (131), though what follows is actually pretty tame. But then again, I have to assume that all this comes across as right and proper to her somewhat infantilized readership who is ever in need of psy-

chological safety. Maybe all this "works" in some fashion, regardless of its disdain of science.

I still think there is something interesting for skeptics in *Postcolonial Astrology*. It's not an example of pseudoscience because it doesn't even try to fake being scientific. It is, however, an illustration of a way of thinking that bypasses science in favor of feelings of insight. Such a way of thinking is a common element in the anti-science attitudes often embraced by unorganized, individualist spiritualities. This book, by wrapping up astrology together with fashionable professional-class moral posturing, provides a concentrated example of a tendency that will continue to irritate many skeptics and friends of science. And it is good for some occasional amusement, though not in any way that the author intended. ■

Taner Edis (edis@truman.edu) is a CSI fellow and professor of physics at Truman State University. His latest book is *Weirdness! What Fake Science and the Paranormal Tell Us about the Nature of Science* (Pitchstone, 2021).

The Rises and Falls of One-True-Cure Oddballs

William M. London

If It Sounds Like a Quack … A Journey to the Fringes of American Medicine. By Matthew Hongoltz-Hetling. New York, NY: PublicAffairs, 2023. ISBN 978-1-5417-8887-9. 323 pp. Hardcover, $29.00.

Matthew Hongoltz-Hetling devotes most of his engrossing book *If It Sounds Like a Quack…* to describing how some of the most preposterous panacea promoters in the United States came to conclude they had found the "One True Cure," gained devotees, and—with one exception—suffered humiliating downfalls.

The purported One True Cure promoted by dentist Larry Lytle was so-called "universal healing energy" supposedly offered through his low-level laser devices. He advertised them "for the treatment of any unknown condition."

Toby McAdam marketed herbal concoctions for treating cancer and other serious diseases. He sold oils, salves, tonics, tinctures, and oral cleansing products containing caustic bloodroot.

Robert O. Young, who misrepresented himself as a highly educated, distinguished scientist, promoted various bizarre treatments as well as the false notion that health depends primarily on the degree of acidity or alkalinity of body fluids. He marketed dietary modification and supplements for pH optimization.

The One True Cure of Leilani and Dale Neuman, a married couple who founded a Pentecostal ministry in rural Wisconsin, continues to be prayer, even after observing a tragic failure of it to be therapeutic for a medically manageable condition.

Another One True Cure promoter told Hongoltz-Hetling what he claimed to have revealed to only a select group of people: that he was an ancient god from the Andromeda galaxy currently living in the body of a straight, white, male human named Jim Humble. Hongoltz-Hetling refers to him as "the alien in Humble's skin." I chuckled when he explained: "And, really, I can't prove that he isn't."

Humble's One True Cure was a bleach solution originally known as Humble's Health Drink and eventually known as Miracle Mineral Solution (MMS). Humble promoted MMS in his online book *The Miracle Mineral Supplement of the 21st Century*. He eventually teamed up with Mark Grenon, an ardent Bible student and preacher who had set up a residential mission in the Dominican Republic. In 2011, they created the Genesis II Church of Health and Healing with Humble as cofounding archbishop and Grenon as cofounding bishop. They denied that Genesis II *sold* MMS—as they knew doing so would run afoul of the U.S. Food and Drug Administration (FDA). But they accepted twen-

'Miracle' Tonic. Photo Credit: LittleT889 | Wikipedia

ty-dollar "donations" and gave donors four-ounce bottles of the church's signature miracle sacramental cleansing water. The "church" also hosted seminars, charging attendees $450 to become Genesis II health ministers, and set up MMS-focused retreats at the MMS "Restoration Center" in Santa Marta, Colombia. Genesis II continued to operate even after Humble left it in 2015 over a disagreement with Grenon.

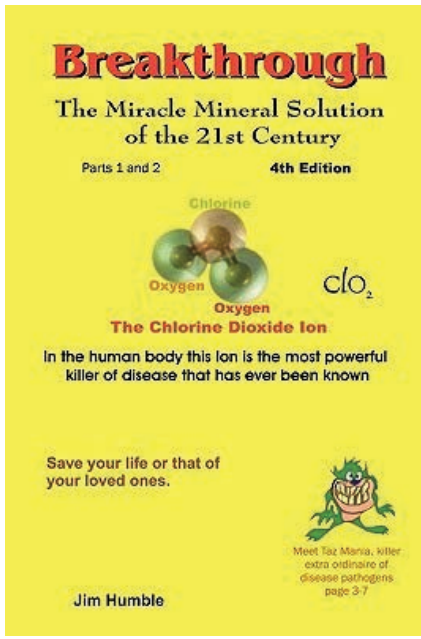
Alicja Kolyszko became the major popularizer in the United States of hirudotherapy (leech therapy). Hongoltz-Hetling writes that in the late 1990s, she referred to herself as Dr. A-Leech-A in online advertisements, personally treated patients wherever she went, and received favorable mainstream media attention. Although evidence is lacking to support Kolysko's belief that hirudotherapy is effective against a variety of serious health problems, in 2004 the FDA permitted the sale of one leech species as a medical device for promoting blood flow following cosmetic and reconstructive surgeries. In 2011, Kolysko founded the Academy of Hirudotherapy, which provides hirudotherapy training and a certification process recognized by various international organizations. According to Hongoltz-Hetling:

> Unlike the other One True Cure practitioners I spoke with, Alicja has accepted the responsibility of ensuring that her operation is within the scope of the law. The academy is powered by a curriculum designed to keep patients safe and practitioners out of regulatory trouble. To do this, Alicja drew on her experience working as a dialysis technician within the US health care system. She is well versed in how to create and maintain a sterile working environment, and she studied applicable regulations in various states to make sure she was legal (214).

It doesn't appear Kolyszko ever ran afoul of law enforcement authorities as the other featured panacea promoters did. Nevertheless, I was disappointed that Hongoltz-Hetling didn't discuss her practice of offering "Alternative Biocure with Medical Leeches," the murky description on her website of her qualifications (including that—as of this writing—she was finishing her education as a doctor of naturopathic medicine, had "pending" MS/PhD degrees in gerontology from the University of Southern California, "pending" BS/MS degrees in nursing/health care management from Columbia University, lists various "alternative" practitioner certifications, uses the prefix "Dr." with her name, and uses unusual suffixes with her name, including "DHT")—not to mention her promotional hype. The About section of Kolyszko's website declares:

> A pleasant and welcoming atmosphere is created by Kolyszko wherever she provides leech-therapy. Hirudotherapy, the treatment of many ailments, is used to improve conditions, she explains, and plays a role in optimum health by retaining general wellness. Kolyszko assists in detoxification, rejuvenation and blood purification process, using medicinal leeches.

Nevertheless, Hongoltz-Hetling's book is a significant contribution to the literature on the promotion of what Hongoltz-Hetling calls "science-lite health care." It addresses how fringe medicine is thriving and harming American society. It blames the problem on the dysfunctional American health care system, the lax regulatory environment for dietary supplements, how ill-equipped the FDA is to deal with panacea promoters, flawed government institutions, and the misguided medical freedom movement.



Jim Humble's self-published book.

Hongoltz-Hetling considers potential solutions, but he sees no short-term fix. Based on his research, he concludes "there is no One True Cure for the One True Cure."

The book's thirty-nine-page bibliography is indicative of substantial investigative efforts. Unfortunately, the book has no citations within the text, no notes section, and no index; it's less useful for health care scholars to rely on than it should be.

Hongoltz-Hetling's discussions of interviews with a victim of a panacea promoter and a participant in a faith healing training session are fascinating and illuminating. I'm impressed that he gained enough trust of panacea promoters for them to share intimate details of their lives with him in interviews. He tells their remarkable stories with a well-balanced combination of empathy, wit, and snark.

I strongly recommend *If It Sounds Like a Quack...* for readers who appreciate exceptional storytelling, black comedy, and healthy skepticism. I think many people who are drawn to the fringes of American medicine would like it too. ■

William M. London is a professor of public health at Cal State LA, the editor of *Consumer Health Digest* e-newsletter at Quackwatch, and a columnist for *Skeptical Inquirer* online.

Remembering Kendrick Frazier

It was with a sense of loss and regret that I belatedly learned of the passing of Kendrick Frazier. I had the honor of collaborating with Frazier in late 2008 on an article about my book, *West Wind Clear*, a documentary history about the "Winds Message" imbroglio and Pearl Harbor surprise attack. Frazier found my work "interesting and worthwhile," and it was featured on the front cover of Skeptical Inquirer ("The Pearl Harbor Winds Message Controversy: A New Critical Evaluation," March/April 2009).

Admittedly, the "Winds Message" controversy was "on the edge" of the "typical" subject of SI, but conspiratorial thinking knows no boundaries; Frazier understood that the implications of conspiratorial or "white-washed" history were as sinister as those arising from pseudoscience, anti-science, and so on. I can only hope that we follow on with his stance on these issues.

Robert J. Hanyok
Laurel, Maryland

The Skeptic's Dilemma

Thank you, Robyn E. Blumner for pointing out the need to speak up against dogma ("The Skeptic's Dilemma: To Speak or Not to Speak," March/April 2023). During a recent TV interview, Marc Elias of Democracy Docket lamented the many lies and false statements by members of the Republican establishment (e.g., "stolen" elections of 2020/2022 and anti-vaxing). Candidly, he confessed to not knowing how to get the public to abandon these extreme views even if the politicians of all stripes recant theirs. He noted once those views are swallowed hook, line, and sinker—after years of being lied to—most citizens are not inclined to suddenly stop supporting the specious dictates.

In reply to those who are entrenched in seemingly uncompromising falsehoods, Professor Lee McIntyre (Center for Philosophy and History of Science, Boston University) uses a short yet cogent question that can help defuse flawed thinking. His reasoned approach is simple but fair: "What evidence would make you change your mind about this?" If the individual replies, "Nothing would," then the belief being insisted on is based on dogma, not fact. McIntyre then goes on to explain that dogma fails the test of why only evidence-based facts can answer his question. I look forward to trying it but—all evidence aside—we are dealing with passionate *Homo sapiens*, aren't we?!

Howard W. Braham, PhD
Spokane Valley, Washington

How Spiritual Is Deepak Chopra?

Re: "How Spiritual Is Deepak Chopra?," by Susan Blackmore, March/April 2023: The very question in Susan Blackmore's fascinating commentary on a New Age guru begs a whole host of other questions for me. Is she asking about his ethics, as in, is he holy? The entire approach, even insinuating that humans can be at all "spiritual" leaves me scratching my skeptical head. Spiritual remains a metaphor for what we do not know or perhaps can know about that utterly pure Platonic realm other than, say, the Pythagorean theorem exists outside of the physical world of triangles. Is that spiritual? A better word might be *ideal*. So, what is the difference? Ideals do not carry the weight of agency outside of the manifested world in which we experience being. Spiritual energies and spirits do for believers. Fundamentalists tend to believe in angels and divine power that can interact and interfere with our physical existence. Thus, Deepak Chopra continues to make fundamentalist claims about the agency in the quantum realm guided by what he sees as an intelligent, guiding force that is within us. If you do not believe he knows this, just ask him. He posits the Vedic identification of Atman with Brahman or Christian relationship of soul with God. So, Chopra is a fundamentalist—he takes metaphors literally and then sells them as potentially real energies that you can learn to manipulate, much like New Thought cults teach that you can change things with mind power linked with magical techniques, objects, and plants to heal cancer, increase wealth, or thrive into your hundreds, for examples.

What I am getting at here is that Chopra misappropriates a world religion, but more so he represents the transcendental meditation business of the guru of his youth, the Maharishi Mahesh Yogi—you know, the guy who engaged the Beatles, Mia Farrow, and other celebrities in the 1960s into his business of selling Vedic techniques using mantras or magic sounds that will enlighten you, give you transcendental power, and then help you save the world. The young Chopra broke with Mahesh to start his own business of selling a similarly hybridized and simplistic version of ancient Hindu tradition to naive and "spiritually" hungry non-Hindus. Of course, this is nothing new. After 1893 when Swami Vivekananda established his Vedanta Centers in America, others like The Great Oom (1876–1955), born as Perry Arnold Baker in Leon, Iowa, a.k.a. Doctor (in name only) Pierre Bernard, tapped the spiritual hunger for exotic religion in the early 1900s to set up yoga and meditation centers. Elite seekers in New York City flocked to Bernard. Pete Seeger, the folk singer, grew up at a Bernard commune with his parents and siblings as members. Bernard or "The Great Oom" maintained a kind of zoo at this commune with exotic animals. According to biographer Robert Love, "Bernard loved the risk and reward of business and possessed an innate ability to transform his [yoga] pursuits into profits" (Robert Love, *The Great Oom: The Improbable Birth of Yoga in America*, 2010). Does that sound all too familiar?

I think Blackmore's inability to powerfully confront Chopra's narcissism stems more from her basic assumptions about spiritual reality that unfortunately mimic Chopra's, and he instinctively knew it. If you are playing into his spiritual language game, you better be prepared because he's been at it a long time and he has the power of celebrity to lord over you when you do not agree with him. She used Chopra's hijacking of the four stages of a proper Vedic life as if it were meant literally as twenty-five-year segments to challenge him. That was a serious mistake. That final stage—of becoming your own guru after submitting to a guru to first gain enlightenment—can vary wildly from person to person. Some people naturally behave holier than others, not because they meditate or follow a tradition but because they behave that way. Chopra's behavior offers no evidence that he is any more enlightened or "spiritual" than the average old lady silently sitting in her Episcopal pew in a church in Iowa who never read one of his books or saw him on Oprah.

Joe Szimhart
Pottstown, Pennsylvania

Susan Blackmore's 2022 "debate" with Deepak Chopra was clearly a case of "Gish gallop," as Eugenie Scott dubbed the way Duane Gish used to overwhelm interviewers and debaters with a torrent of cherry-picked, false, or irrelevant statements. I recently

heard Mehdi Hasan describe a method to counter the Gish gallop:

- "Pick the weakest … argument … and hone in on that and put all your energy into ridiculing that, … taking it apart so that the audience … can see that if that argument is so nonsensical and so easily rebutted, what does that say about the other arguments."
- "Don't budge"—no matter what your opponent does, return to your chosen point until you get a relevant, meaningful answer.
- "Call it out"—when your opponent attempts to change the subject or move on, tell them, and the audience, that it's an indication that their statements are false or unsupported. (See https://cafe.com/stay-tuned/debating-101-with-mehdi-hasan/ under "Transcript.")

You just can't treat a huckster like a civilized person.

Van Knowles
Lexington, Kentucky

Susan Blackmore responds:

My article on Deepak Chopra leaves Joe Szimhart "scratching [his] skeptical head." Well he leaves me scratching my skeptical head. I neither believe in his "utterly pure Platonic realm" nor assume a "spiritual reality." The word spiritual *is not well defined but more than two thousand years after Plato is commonly used to include ethical behavior, motivations beyond self and material gain, and practices such as contemplation, mindfulness, and meditation. This requires no "spiritual reality" or other realm. My agreements with Deepak Chopra are confined to such claims as that long-term meditation can lead to positive changes. One of my mistakes was to think that pointing out where I agree with him might help me expose those vacuous and just plain batty ideas I don't agree with.*

Szimhart calls it a "serious mistake" to imply that the Vedic stages refer to twenty-five-year stretches, but it was Chopra himself who had talked about the four quarters of his own life and said he would live to be 100. Tackling this, I did at least partly answer my own question. I showed that he does not practice what he preaches, and he has no intention (at least for now?) of following the path he makes money from by selling it to others.

I made many mistakes. I could have kept bringing Chopra back to the question we were asked to discuss: Why is there sentience? I could have tackled his abuse of science and his false claims about the brain and consciousness. Yet having debated with him before, I know he would still have managed to wriggle out of answering by changing the subject and avoiding the question.

Thanks to Van Knowles, I now know about "Gish gallop" and wish I had prepared myself by reading Eugenie Scott's description of how it is done and learned how to counter it. One trick not mentioned is that Chopra frequently interrupted me, and I (being too polite) did not object. But when I interrupted him, he complained. Some of the many audience members who came up to me afterward said they had appreciated my polite manner, but I still wish I had been tougher. Still—if I achieved anything—it was to show several ways in which Chopra is a hypocrite as well as a misogynistic bully.

Ten Health and Wellness Fallacies

Nick Tiller ("Ten Health and Wellness Fallacies Every Skeptic Should Know," March/April 2023) claims that Francis Bacon described the observational selection fallacy as "counting the hits and forgetting the misses." Bacon was not quite so pithy. In his posthumously published *Sylva Sylvarum, or, A Natural History in Ten Centuries* (1627), he identified "the general root of superstition: namely, that men observe when things hit, and not when they miss; and commit to memory the one, and forget and pass over the other." A possible source for the confusion is *The Demon-Haunted World* (1997), in which Carl Sagan discussed "observational selection … or as the philosopher Francis Bacon described it, counting the hits and forgetting the misses": although Sagan was not purporting to quote Bacon verbatim, it would be easy for a reader to assume that he was.

Glenn Branch
National Center for Science Education
Oakland, California

I would like to add to your informative Ten Health and Wellness Fallacies article that a red flag is spurious marketing claims that use weasel words such as "helps X," or "fights X," or worse a combo of weasel words such as "helps fight X." Anything following a weasel word in a claim is usually legally meaningless and has no measurable way to have its truth assessed. For example, it's much easier to measure a claim such as "prevents Alzheimer's" than it would be to measure "helps fight Alzheimer's," the former being far less ambiguous than the latter!

Thanks for another great issue.

David McAdam
Toronto, Ontario, Canada

As a chemist, I was surprised to read in Nick Tiller's otherwise fine article (March/April 2023) that the structure of the glucose molecule could be seen with an electron microscope. I have used an electron microscope many times and have yet to resolve even my salary, let alone a glucose molecule. More seriously, individual molecules of glucose are too small to be resolved as clearly as in his diagram. The structure was determined in 1891 by chemist Emil Fischer by a combination of clever deduction from chemical reactions and what was known about valence, stereochemistry, and symmetry. A feat that earned him the 1902 Nobel Prize. Nowadays, we can determine molecular structures with spectroscopic and X-ray diffraction techniques he could never have imagined, but electron microscopy can still only manage blurry images of very large molecules at best.

Stephen Moreton, PhD
Warrington, England, U.K.

An anecdote: I was in a mall, and one of those persons with an atomizer was trying to spray passersby. I demurred, commenting, "I have some allergies."

She said, "Oh, it's perfectly safe. It's completely natural!"

"So is poison ivy," I responded.

Richard G. Wilkes
Wyandotte, Michigan

Fidalgo's CSICon Report: Expanding the Moral Circle

As Fidalgo's article ("Skeptics' Expanding Moral Circle," March/April 2023) said, "People have feelings about the things they are told as much as they intellectually process them, especially when the topic is something close to their hearts, aspirations, and beliefs."

This is something that skeptics need to consider more often. We often hear that Arthur Conan Doyle was gullible regarding seances. Yet we are seldom told that his son was killed in World War I and he desperately longed for contact with him.

Thomas Luther Robertson III
Philadelphia, Pennsylvania

Norman Carlson and Karl Felsens Letters about Massimo Pigliucci

I have read cover to cover Skeptical Inquirer, every issue, since July 1995, including Letters to the Editor, which I often find as enlightening as the articles. In the March/April 2023 edition, I have finally found evidence of future sight. It is obvious to me that Karl Felsen's perfect rebuttal to Norman Carlson's critique of Massimo Pigliucci's article "The (Linguistic) Fall of Rationality" immediately following Carlson's

screed proves future sight exists. Thanks for keeping my eighty-year-old brain active.

Dwight DeMaine
Minneapolis, Minnesota

As I was reading the Letters to the Editor section in the March/April 2023 edition, I had to admit to being shocked that you would publish the letter by Norman Carlson blaming women for the fall of rationality. It was certainly deeply offensive to your female readers, me included. But then I thought good for you for publishing this man's laughable opinion so that it will be in writing for the whole world to see, and more importantly it serves as a public service announcement for the all the women of Busti, New York, to stay far away from Norman Carlson!

Melanie An
Burlington, Vermont

Vyse's CSICon Report on the Legal Environment

I am writing concerning Stuart Vyse's article "CSICon Report: The Highs and Lows of the Current Legal Environment" (March/April 2023). The article falsely stated the *Dobbs v. Jackson Women's Health Organization* decision "eliminated women's fifty-year right to abortion." The decision stated that, while there is no federal right to abortion, each state has the right to determine its own laws about abortion. This article also criticizes the use of the rationale of "the 'major questions doctrine,' which cannot be found anywhere in the Constitution." That criticism is ironic because the article also cites the rationale of "the Constitutional wall between church and state," which is not stated in the Constitution.

Peter Janangelo, Jr.
Las Vegas, Nevada

Stuart Vyse responds:

Peter Janangelo is correct; the Dobbs v. Jackson Women's Health Organization *decision eliminated abortion as a Constitutional right available to all American women regardless of the state where they live, despite abortion having been considered such for fifty years. Abortion will remain available in some states.*

However, Thomas Jefferson disagreed with Janangelo's opinion that the principle of separation of church and state is not in the Constitution. According to Cornell Law School Legal Information Institute: "Separation of Church and State is a phrase that refers to the Establishment Clause of the First Amendment. The phrase dates back to the early days of U.S. history, and Thomas Jefferson referred to the First Amendment as creating a 'wall of separation' between church and state as the third president of the U.S." The same cannot be said for the "major questions doctrine."

Starlink

Re: "The Great Starlink Racetrack UFO Flap of 2022" by Mick West, SI, March/April 2023. I consider myself relatively aware of world news and science issues, and yet I am embarrassed that I have never heard the word *Starlink*. If I had ever seen a chain of fifty or more lights in a straight line streaking across the sky, old skeptic that I am, I probably would have freaked out. And then the Skeptical Inquirer does what it always does and turns what appeared to be a supernatural mystery into a logical explanation, in this case a group of low-orbit satellites released in a group to provide internet connections to remote areas like the one in which I live.

Because the Starlink phenomenon will be with us for many years and West tells us that the rational explanation is not well known and that sky watchers and many airline pilots to this very day are nervous and confused when they spot a Starlink, we come back to why I believe this is seriously important. Why have the news media in all its forms not brought this Starlink phenomenon to the common knowledge of the general public?

Rick Ronvik
Sister Bay, Wisconsin

Apocalyptic Pseudoarcheology

In Damian Fernandez-Beanato's article "Apocalyptic Pseudoarcheology" (March/April 2023), his skepticism regarding journalist Graham Hancock's *Ancient Apocalypse* series is appreciated, yet Hancock's theories seem plausible given recent scientific discoveries. The biblical flood was once written off by many scientists as imagination; however, modern science, via ice core samples from Greenland, reveal catastrophic floods inundating the globe during the Younger-Dryas. The probability of cataclysms during this period is also supported by the discovery of a coinciding global bottleneck of human DNA, showing severe population reduction. The period's burn layer and lava deposits evidence tremendous volcanic/tectonic activity and comet strikes with 75 percent megafauna extinction. Passing of memories to future generations as stories seems likely. Unfortunately, Fernandez-Beanato begins by casting shade on Hancock's credibility, comparing him, erroneously, to 1960s–1970s extraterrestrial civilization authors. Also, he exalts the Occam's razor principle, favoring the least assumptive theory given the same data, yet its weakness is the danger of stifling scientific verification through predicting and proving the territory, instead functioning as a blank map for justifying personal beliefs (mainstream or not). The simplest explanation is not always accurate: Archeologists asserted that Native Americans had resided in the Americas since just before the Neolithic, yet human footprints in White Sands National Park were recently found dating back 22,000 years, and the Cerutti Mastodon site supports hominid presence in North America 130,000 years ago.

David Anthony Fulps
San Gabriel, California

Damian Fernandez-Beanato responds:

Thank you very much to David Fulps for his intelligent and informed critique of my article "Apocalyptic Pseudoarchaeology." I'd like to respectfully make the following points in response.

The story of the flood we all know is still generally thought by most historians to have originated in the Old Babylonian Period (c. 1880–1595 BCE) before passing to the Hebrews. It is thought to be consistent with regional floods and the product of a riverine civilization in an area prone to flooding for which a valley-wide flood could have "destroyed" the whole of their known world. Other cultures in distant places had their own flood stories (most places have seen floods). While it is possible that oral tradition linked the Younger Dryas (or an ancient asteroid strike) and some of the flood stories across thousands and thousands of years, that's not necessarily so. The stories aren't evidence for the Younger Dryas or for asteroid impacts (the threads would be too tenuous), and the Younger Dryas doesn't corroborate the stories (which are indeed highly imaginative).

An erroneous comparison is one that misrepresents properties of the things being compared or that infers the wrong conclusions. My comparison of Graham Hancock with ancient-astronauts theorists doesn't do any of that; on the contrary, it underscores that he is different from them in that he doesn't invoke extraterrestrials, which is in his favor. So nothing is wrong with the comparison.

Occam's razor, the principle of parsimony, is a generally accepted principle of science. It is weak only in isolation, but science possesses many other properties that complement the "razor." The "razor" doesn't require that the simplest explanation always be accurate, and it doesn't direct scientists to avoid probing territories. It just suggests guidelines for what to do once the field has been thoroughly probed and the information gathered.

The jury on the Cerutti Mastodon site is still out, so we shouldn't be too excited until paleontologists, archeologists, and anthropolo-

gists reach a consensus on it. In any case, Hancock should have at least mentioned his alleged evidence.

Ian Bryce on Rossi's E-Cat Simulation (From May/June 2019)

In 2019, you published the article "Rossi's E-Cat: Exposé of a Claimed Cold Fusion Device," by Ian Bryce, about an Italian-born inventor named Andrea Rossi. Bryce described how he discovered how Andrea Rossi faked his results: "On January 19, 2012, the likely answer came to me in my sleep." Bryce speculated that Rossi had been feeding hidden power through a ground wire. I have recently learned that Rossi is active again and, for the first time, I have seen Bryce's article.

Bryce also wrote about the investigation I had previously reported: "Although suspicious of Rossi and publishing many speculations, [Krivit] was never able to find any trick in the demonstrations. I informed him of my findings and expected him to run an article, but he refused. Sour grapes, perhaps?"

In fact, Bryce was aware of Rossi's water/steam trick that I and my readers exposed six months earlier. Nevertheless, we had also mentioned Bryce's theory in a February 13, 2012, article.[1] Bryce's theory, however, was predicated on his assertion that Rossi's device did produce a massive outflow of steam. Nobody has ever witnessed this. Bryce's theory assumes that scientifically valid measurements of heat or steam output in Rossi's experiment existed. As I and other people explained to Bryce on February 15, 2012, they didn't.[2] By that time, not one of Rossi's experiments had been instrumented properly to measure heat or steam production.

I went there and filmed it. I published the video on June 20, 2011.[3] In fact, several months before SI published the Bryce article, SI published an article by Sadri Hassani, who specifically cited my investigation and my video recording in which I discovered Rossi's trick: sending unvaporized water down a hole in the wall.

The first scientists who saw my video of the tiny puffs of steam coming out of the black hose burst out laughing. Rossi's device clearly was not producing thousands of watts of steam. On July 30, 2011, I published a 200-page report.[4] It contained three dozen detailed technical analyses, calculations, and diagrams by experts worldwide, including scientists, mechanical engineers, steam engineers, inventors, physicists, and even a NASA rocket scientist. The power output rate from the steam was approximately equal to the power input rate from the wall plug.

References

1. https://news.newenergytimes.net/2012/02/13/rossis-australian-investment-opportunity-falls-through/
2. https://web.archive.org/web/20120217094208/http:/blog.newenergytimes.com/2012/02/13/rossis-australian-investment-opportunity-falls-through/
3. https://www.youtube.com/watch?v=m-8QdVwY98E
4. http://newenergytimes.com/v2/news/2011/37/NET370.shtml

Steven B. Krivit
San Rafael, California

Ian Bryce responds:

First, I acknowledge that Steven Krivit wrote correctly around 2011 that a deficiency in Rossi's demonstrations was that the water/steam ratio was not properly measured.

But by then, I had rejected this theory as not fitting the observations.

At the March 29 demonstration, Essén and Kullander recorded a detailed temperature history of the start-up and running process. I reverse engineered their data and hence estimated power flows. This was described in detail in my reference Bryce 2019c, earth wire hypothesis for each E-cat test. It is still available online. The relevant figure is reproduced here.

This reveals a thermal power output during start-up of approximately 800 watts. During steady state, the power is often around 800 W, assuming only 10 percent is steam. Meanwhile, the electrical power input was 345 W.

Thus, Krivit's steam/water hypothesis does not fit the facts, while the earth wire does.

I also outlined further predictions of the earth wire hypothesis, later confirmed, including:

Rossi's constant attendance at the blue box—ready to turn off the secret supply;

The thermal power dropping briefly to zero—as if an observer approached the power measurement;

The excess power usually matching the capacity of the earth wire used—3,000 watts;

And Rossi's reactions—to refuse Smith's offer of $1M to allow an independent observer, and to call us "Aussie roadkill"—hardly from a potential Nobel laureate!

Note also that Krivit's stream/water theory was only one hypothesis, buried among dozens in his 200-page report, while I published what I maintain is the only plausible explanation in a one-page report.

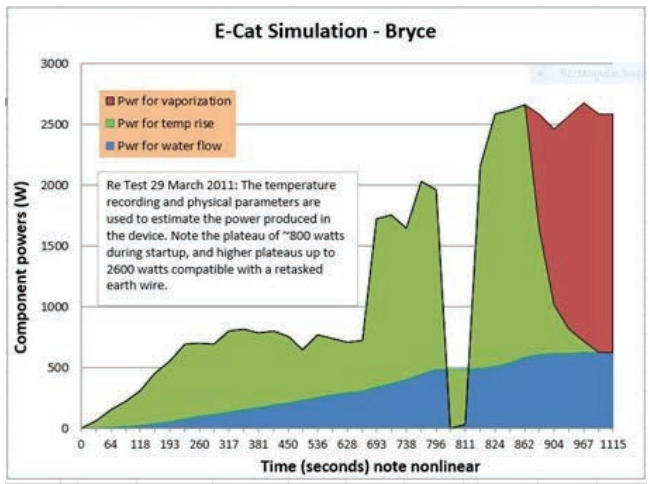
Later developments: *I recently visited skeptic organizations in Europe to discuss Rossi and E-cat and other matters. These included two groups at CICAP in Italy, where Rossi performed the tests, and two at VoF in Sweden, where he received the strongest support from scientists.*

As in all science, progress is made not by "proofs" but by surviving attempts to disprove, and our work has survived intact.

Rossi has used a long list of devices to demonstrate "cold fusion." His latest is a light source that he claims uses Zero Pont Energy.

Has Rossi profited? Recall that a group of investors called Industrial Heat contracted $89 million for a demonstration of a one megawatt plant in 2015. But Rossi would not allow their engineers to attend the test! Industrial Heat declined to pay, and Rossi sued them. They reportedly settled out of court. I am told that Rossi used his settlement to buy properties, and he now lives on the returns.

We can conclude that our exposé has been well covered in the skeptical literature, in Wikipedia, and on many blogs. Due diligence by any new investor will quickly reveal this history. Even ardent followers are having second thoughts. I understand that Rossi's funding has dried up, and he is now considered irrelevant.


E-Cat Simulation - Bryce
Pwr for vaporization
Pwr for temp rise
Pwr for water flow
Re Test 29 March 2011: The temperature recording and physical parameters are used to estimate the power produced in the device. Note the plateau of ~800 watts during startup, and higher plateaus up to 2600 watts compatible with a retasked earth wire.
Component powers (W)
3000
2500
2000
1500
1000
500
0
0 64 118 193 260 317 381 450 536 628 693 738 796 811 824 862 904 967 1115
Time (seconds) note nonlinear

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